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Section of Laryngology.

President—Mr. T. MARK HOVELL, F.R.C.S.Ed.

(*November* 3, 1916.)

PRESIDENTIAL ADDRESS.

By T. MARK HOVELL, F.R.C.S.Ed.

As all the Fellows of this Section are teachers, it is their views and methods which, in a great measure, mould the opinion and lines of practice of the younger members of the profession who are learning this branch of their work, and therefore, as a Section, a considerable amount of responsibility rests on its members.

Many of the diseases dealt with in this Section are not local in their origin, and it was mainly due to this fact that Sir Morell Mackenzie had to encounter an immense amount of opposition when laying the foundations of the specialty of laryngology. I well remember Sir Richard Quain, who, by the way, was a very shrewd and capable practitioner, ridiculing the idea of diseases of the throat being regarded as a specialty, for he argued that most of them had their origin below the diaphragm, and, of course, there are ample grounds for this statement.

We all know that the commonest cause of functional aphonia in women at or past middle life, and in some cases of young women, is due to displacement of the uterus, or some other affection of that organ, displacement of the uterus being by no means uncommon in unmarried girls, and likely to become still more frequently met with now that they ride astride.

Granular pharyngitis also is not the result of improper voice production, but of derangement in either the gastro-intestinal or utero-vaginal tract or both of them combined, so that dyspepsia, constipation,

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or bowel derangement producing looseness, &c., displacement of the uterus, or other uterine affections, and leucorrhœa, all require to be seriously treated if the throat affection is to be cured.

Then, again, the connexion between nasal irritation and bowel irritation is known to almost every old woman, and if she sees a child picking his nose she says without the slightest hesitation, "that child has worms," and her diagnosis is very often correct. As specialists we know that the cases of nasal obstruction due merely to hypertrophy of the soft tissues, which are not relieved by cauterization, in many instances are the result of gastro-intestinal irritation which has been overlooked or insufficiently treated, and it is felt in many cases when this region has been thoroughly dealt with that if this had been done in the first instance, cauterization might have been unnecessary.

Although the facts alluded to by Sir Richard Quain are known to all of us and acted upon, yet the great progress which has been made in the treatment of throat affections could not have taken place if the specialty had not been created. The greatest advance has been made in surgical procedure, especially with regard to laryngo-fissure, the submucous resection of the nasal septum, and operations in connexion with the sinuses contiguous to the nose. Then, again, the improvements in electrical apparatus have enabled foreign bodies to be removed from the œsophagus and air passages, with the aid of direct vision, from a situation which was previously inaccessible without exposing the patient to grave risk.

With regard to the direct method, I cannot help feeling that it would be greatly to the advantage of the younger members who practise in our branch if they were to train themselves also to the indirect method, which is most useful for the removal of papillomata and the treatment of nodules on the vocal cords, as well as other laryngeal conditions. It is quite easy and merely requires the hand to work in accord with the object in the mirror, and with practice the action becomes automatic, the fact that the image is reversed being entirely disregarded.

It is to be regretted that general surgeons do not more quickly adopt the improved methods of procedure introduced by specialists. I have in mind at the moment local anæsthesia to assist the operation of tracheotomy as opposed to general anæsthesia. It is more than forty years since Sir Morell Mackenzie introduced local anæsthesia for this operation, the result being obtained by freezing the skin with a preparation known as "anæsthetic-ether," which was prepared by a firm of chemists named Robbins in Oxford Street. When the skin has been frozen the trachea can be easily reached with but little discomfort to the patient, who is best seated in an arm-chair. The youngest patient that I remember having operated upon by this method was a boy aged 14. Now that local anæsthesia can be produced by subcutaneous injection of drugs it is to be hoped that this method will become universally adopted, for its advantages are obvious.

Before leaving the subject of tracheotomy I should like to refer to another detail introduced by Sir Morell Mackenzie which greatly adds to the comfort of the patient. It consists in inserting a piece of ½-in. elastic about 3 in. long into the tape on each side which holds the tube in position, the tape being fastened to the tube by means of the snap fasteners such as ladies use for fastening their dresses, and the tape being fastened behind by either tying or having a hole in one tape into which a hook on the other is inserted. But I still see only tape used systematically by general surgeons, which is no improvement in the method of a century ago.

I am one of those who feel that patients with malignant disease ought not to be allowed to suffer unnecessary pain, and therefore mention the treatment employed in the case of a lady by a physician who died a few years ago. He began to relieve her pain with the ordinary doses of morphia, but as she became tolerant to the drug, and the extension of the disease made the pain more severe, he gradually increased the dose until the daily dose given amounted to between 30 and 40 gr., and on days when the pain was more than usually severe the doses given amounted to between 40 and 50 gr. He told me that the patient used to awake, take her food, chat, and be quite comfortable until the return of the pain made another dose of morphia necessary, when she again relapsed into sleep, and thus she was kept to the end comparatively free from pain and in as comfortable a condition as it was possible to keep her whilst suffering from what would otherwise have been a most painful as well as mortal disease. The physician to whom I have alluded, as is evident, did not trammel his actions with the posological table of the Pharmacopœia, but based his methods on common sense, which is the rock bottom of successful medical treatment.

Although curative measures cannot always be disassociated from pain, every care should, I think, be taken to produce as little as possible. At the present time almost every practitioner considers himself competent to operate for adenoid growths, and, from what I am told, there appears to be far more pain following this operation than is necessary. The cause is obvious: the operation is begun before the patient is sufficiently anæsthetized, and the soft palate as a consequence thoroughly relaxed, and therefore it becomes torn and thus the subsequent pain is produced. If the operator were to wait perhaps only another minute the soft palate would become completely flaccid and could be lifted out of the way. A skilled anæsthetist has no difficulty in maintaining the soft palate in this condition throughout the operation and yet allowing the reflexes of coughing and swallowing to be retained.

When the tonsils are removed there is, of course, slight pain on swallowing for a day or so, but this can be practically abolished by the method which I introduced many years ago, of placing the palm of a hand over each ear with the fingers pointing upwards and then making very firm pressure whilst the patient swallows, the greater the pressure the greater being the relief from the pain. This simple method applies to all cases of odynophagia, no matter what the cause.

I gather that the removal of the posterior extremity of each inferior turbinated body when enlarged is still not universally regarded as an essential part of the operation for the removal of adenoid growths, but I take this opportunity again to repeat, as a result of extended experience, that since I performed this very simple addition to the operation for the removal of adenoid growths I have not had cases of recurrence.

I must repeat that no harm can result from passing a snare through the nostril, even should it not encircle hypertrophied tissue, and that it cannot be ascertained whether the ends are enlarged sufficiently for removal or not by touching them with a finger. I still hear that it is thought that the procedure is difficult, but on the contrary it is extremely simple if the point of the loop is steadied against the side of the choana with the left forefinger, and the snare is held lightly in the right hand and run forward as the loop is contracted.

We all know that it is not only the duty but the privilege of members of our profession to relieve pain, and as all of us are treating, almost daily, cases of granular pharyngitis, we are therefore, aware of the frequency with which girls and unmarried women suffer pain at their periods, as it is a condition which is so frequently associated with this affection, although it is common amongst other individuals who do not exhibit throat symptoms. From the frequency of its occurrence it is evident that throughout the profession there is at the present time a large amount of indifference to this periodical suffering, which we all know at times to be severe, as otherwise patients would not be suffering in this way when they come to us for throat treatment.

I feel, therefore, that we as a Section, having to deal so largely with these cases, may not only teach how to relieve this suffering, but continue to set the example of relieving it. In the large majority of cases it is so simple a matter that it entails writing only one prescription. Drachm doses of liquor caulophylli et pulsatillæ taken every two hours, as soon as the pain at the period commences, or three times a day if there are twinges of pain before the period comes on, not only relieve the pain in the course of a few hours, but if the remedy is repeated with each succeeding period, in many cases the pain becomes a thing of the past and remains entirely absent for years. If liquor caulophylli et pulsatillæ is combined with spirits of chloroform, compound tincture of cardamoms and glycerine, the mixture is not disagreeable. The neuralgic cases are, of course, much more difficult to treat, but fortunately they are in the minority, though most of them only require a little thought as to the selection of the remedies which are tabulated in most pharmacopœias and a proper adjustment of the dose to obtain relief.

There may be gynæcologists and others who will say that treatment of this ailment belongs to their department and does not concern us as throat specialists, but to these I would point out that it is the duty of every medical man to relieve pain and it would not be necessary for us so to treat these patients if they had not been neglected, as otherwise the pain would not exist or they would be in possession of the remedy. I would also remind them that it was the Priest and the Levite who professed philanthropy and goodness, but nevertheless when they saw the man lying wounded and half dead by the roadside, passed by on the other side, and that it was the Samaritan who did not profess to be better than his neighbours who relieved the man's suffering and took care of him.

Although surgery must claim the greatest improvement in the methods of treatment of the affections dealt with by our specialty, yet from time to time medicinal measures are discovered which are of great service, and as I consider it is the duty of all to make them known, I propose to mention a few remedies which I am inclined to think are not as generally known as they might be.

Some cases of loss of smell and taste and of paroxysmal sneezing are relieved by tincture of aconite, which for this purpose may be given only three times a day; it is not an infallible remedy but a useful one to remember. For the relief of the effects of coryza, oil of peppermint volatilized by heat and the fumes inhaled, is recommended by

Martindale in the "Extra Pharmacopœia" in preference to menthol, a free airway being frequently obtained after a few sniffs. Used in this manner it frequently cuts short a nasal catarrh and allows patients to obtain sleep who have previously been kept awake by the blocked condition of the nostrils; it also removes headache when due to a congested condition of the lining membrane of the frontal sinuses. The simplest way to use the oil is to place two or three drops in a spoon and then warm it; this amount will serve several times.

The cases of tickling cough which not only are very common after influenza, but which may follow a simple cold, or occur without known cause, are frequently due to enlargement of the lingual tonsil, the cough apparently being produced by the swollen tissue coming into contact with the epiglottis. A solution of chloride of zinc, 15 to 20 gr. to the oz., with a trace of dilute hydrochloric acid to dissolve the salt thoroughly, is in many cases sufficient to remove the trouble, but I am indebted to Mr. Morley Agar for calling my attention to the best remedy for this condition—namely, trichloracetic acid. A very small quantity only of this drug is required and it is best applied on a wool holder bent at a right angle, with only a very thin layer of wool attached to it so as to ensure the quantity of acid being small. It is best applied with the aid of a mirror so that it can be accurately placed on the swollen tissue.

Enlargement of the lingual tonsil is not usually recognized as a source of throat irritation so far as I am aware, for if this were so the cases of paroxysmal cough which are so frequently met with would not be allowed to continue as they do. I have recently come across a case which I think is pathetic, considering the ease with which a cure has been effected. For fifteen years, a lady, aged 58, has been subject to violent paroxysms of coughing both by day and by night, an attempt to enter into a conversation or certain positions whilst lying down immediately starting the cough, and as a consequence life had become a burden to her. The cough has now almost ceased. When I first saw her the lingual tonsil was considerably enlarged, and from previous experience I felt sure that this was the seat of the trouble. The cough began to lessen after the first application of trichloracetic acid, and as the swelling contracted the greater was the relief obtained, until now the cough is only occasional. Still more recently I have had a similar case in which the cough has lasted for seven years. In this case also the cough diminished as the swelling of the lingual tonsil decreased.

A few months ago, at the repeated requests of many friends, to whom I had suggested the treatment and who had found it very effective, I sent a short letter to the medical press calling attention to the beneficial effects of garlic in whooping-cough. The remedy, as you know, is by no means new, it being known to most old women and herbalists. Immediately I had done so, I heard of an outbreak at a school, and I at once communicated with the medical officer suggesting the use of garlic. The opinion of all the masters and both matrons is that it had an immediate beneficial effect in many cases, but on some it appeared to have no effect. The garlic was administered by peeling the segments of the root, called cloves, cutting them in thin slices and wearing them beneath the sole of the feet between two pairs of socks, for if worn next the skin the irritation of the juice results in sore feet. One of the masters mentioned that a boy who used to cough, previous to the administration of garlic, until he was, as he termed it, black in the face, after using garlic for two days, no longer experienced extreme discomfort.

I have recently seen two patients who had suffered from whooping-cough in whom the cough persisted, and in each case I found that the lingual tonsil was considerably enlarged. Knowing the manner in which this condition produces violent fits of coughing, it occurs to me that this may be the cause of the paroxysms in whooping-cough. As in the case of paroxysmal cough to which I have just referred, the cough began to lessen after the first application of trichloracetic acid, and as the swelling contracted the greater was the relief obtained, until now the cough is only occasional.

If, therefore, I am right in my conjecture that these violent paroxysms of coughing are the result of enlargement of the lingual tonsil, the terrors of whooping-cough have ceased to exist, for I think, without doubt, the juice of garlic passed into the circulation in the raw condition through the skin destroys the micro-organisms of whooping-cough, and if a strong astringent is applied to the swollen lingual tonsil, the source of irritation which produces the cough will be removed. It is probable that any strong astringent would produce the desired effect, and therefore tannic acid, nitrate of silver, iron, zinc, or any other astringent might prove sufficient; but in all cases, of course, care must be taken to prevent the application from trickling into the larynx, a spasm, however, being quickly dispelled if the patient can be induced to speak —" London " being a word which usually answers the purpose.

I am not in a position to see many patients who are recovering from whooping-cough, but I hope that those who do so will carefully examine the condition of the lingual tonsil, and if it is found enlarged record their experience of the application of astringents to the swollen tissue.

I must not detain you longer because there are many cases under discussion, but I hope that every member of this Section will record from time to time his experience of remedies which assist in the alleviation of suffering.

(*November* 3, 1916.)

Cases and Specimens illustrating Work on Atrophic Rhinitis (Ozæna) and Tuberculosis.

By DAN McKENZIE, M.D., JOHN MACKEITH, M.B., and
WYATT WINGRAVE, M.D.

FOR a full account of the work done and conclusions arrived at members are referred to the articles which appeared in the *Journal of Laryngology*, May, June, and July, 1916.

(I) CASES OF ATROPHIC RHINITIS TREATED WITH TUBERCULIN.

BY DAN McKENZIE, M.D., AND JOHN MACKEITH, M.B.

Case I.—Patient, a female, aged 21 (A. P.). Has had atrophic rhinitis of several years' duration, subsequent to cortical mastoid operation. Has had course of tuberculin treatment, from January to September, 1913. In addition to the improvement in the condition of the nose, hearing has greatly improved.

Case II.—Patient, a female, aged 23 (F. K.). Has had atrophic rhinitis for about twelve years. Mother died of phthisis, also an aunt. Had course of tuberculin treatment, October, 1914, to June, 1915. In addition to the improvement in the condition of the nose she does not have "colds" as she used to do.

Case III.—Patient, a male, aged 13½ (B. T.). Had course of tuberculin treatment, March, 1913, to February, 1914, which was followed by violent reactions. No history of tuberculosis in his family. Had enlarged gland (tubercle?) of neck.

Case IV.—Patient, a female, aged 13 (M. F.). Mother died of phthisis. Had four courses of tuberculin treatment: (*a*) July, 1912, to February, 1913; (*b*) June, 1913, to August, 1913; (*c*) October, 1913, to December, 1913; (*d*) March, 1914, to July, 1914.

Case V.—Patient, a female, aged 24 (M. S.). Tubercle bacilli in sputum, May, 1913. No tubercle bacilli in sputum, March, 1914. Had a course of tuberculin treatment, May, 1913, to January, 1914.

Charts and records of the cases are shown.

Mr. Mackeith was solely responsible for the management of these cases during the treatment by tuberculin.

(II) CASES OF ATROPHIC RHINITIS (OZÆNA) IN SISTERS; ACID-FAST BACILLI ABSENT; WASSERMANN REACTION POSITIVE.

BY DAN McKENZIE, M.D.

Case I.—R. A., aged 22. Typical appearances of ozæna. Acid-fast bacilli were not found either in the nasal crusts or in the sputum. Wassermann reaction positive.

Case II.—F. A., aged 20. Conditions similar to those of the first patient, whose sister she is.

Since the appearance of the above-mentioned papers fifteen unselected cases of atrophic rhinitis of different types have been examined, with special reference to the acid-fast bacillus—crusts and discharges from the nose being sent to Dr. Wingrave. Of these fifteen cases the acid-fast bacillus was found to be present in eight and absent in seven. Of the seven *negative* cases, two were post-operative cases with very mild nasal phenomena. In three the Wassermann reaction was positive—these include the cases now exhibited. In two, although they presented the clinical appearances of typical ozæna, no evidence either of tubercle or of syphilis could be found. All eight *positive* cases were diagnosed clinically as ozæna. Two were children, aged 7 and 8 respectively, the youngest patients we have so far seen. Another interesting case was that of a girl, aged 13, the tuberculous family taint appearing in her mother, who was a patient at the Central London Throat and Ear Hospital with lupus of the nose. A maternal aunt and a sister of the girl had died of phthisis. In the nose of this patient there was very little crust deposit, but the fœtor was unmistakable. Attention is directed to the negative cases in which the Wassermann reaction proved positive. This finding may be compared with that formerly reported, in which a partial positive Wassermann reaction was found in a patient who responded negatively to all the tests for tuberculosis.[1]

(III) SPECIMENS OF ATROPHIC RHINITIS (OZÆNA).

EXHIBITED BY WYATT WINGRAVE, M.D.

(1) Acid-fast films prepared direct from ozæna crusts: (*a*) coarse type; (*b*) slender type. Stained by (*a*) fuchsin and methyl green; (*b*) fuchsin and picric acid.

(2) Reinforced clumps.

(3) Growth on Dorset egg and fœtid broth medium.

(4) Sections of gland from inoculated guinea-pigs. "Tubercle" bacilli *in situ*. Stained by orthodox Ziehl-Neelsen (alcohol).

(5) Typical examples of discharge, or ozæna crusts (macroscopic).

Histological Changes.—Alterations in the nasal mucous membrane are not so profound as one would expect. The early or exudative stage, when the discharge is fairly abundant and somewhat "creamy," is not attended by any striking histological feature beyond a distinct increase of the lymphoid and vascular elements. Later, however, when atrophy and fœtor are pronounced, there is decided shrinkage in the whole mucous membrane. Lymphocytic and endothelial infiltration of the glands is now replaced by atrophy of the acini and general fibroplastic tissue, all structures—nerves included—sharing the general atrophy. But the most striking feature is metaplasia of the surface epithelium. The columnar and ciliated cells are entirely replaced by many layers of stratified squames which often block the ducts. These changes extend by continuity to the accessory sinuses, the nasopharynx, the larynx, and even the trachea, but they never pass beyond the muco-cutaneous junction. Ulceration or necrosis never occurs, and bone is never attacked. In this respect it differs entirely from lupus, although it somewhat closely resembles lupus erythematosus, with which it has been found in conjunction. Giant cell systems are never seen.

The Discharge.—In early stages it is somewhat free and contains plenty of mucin, but never resembles pus. So that, even at this early period, it cannot be called "purulent." Later on, it becomes more and more scanty, loses its mucin, and can only be detached with difficulty. Its dark colour may be due to anthracosis or to various chromogenic bacteria, and its degree will vary with its retention *in situ*. Chemically the lipoids predominate, with cell globulin and keratin granules, much being derived from the metaplastic epithelium, which shows the characteristic acid-fast reaction of epidermal cells. For diagnostic purposes, small portions of the green crusts should be spread with normal saline solution on slides, which are then firmly pressed together and separated by sliding. Fixing may be wet or dry. If the fixing is by heat, this should be radiant, and not exceed 40° C., otherwise the bacilli swell up and become deformed. Weak formol alcohol is preferable, which should be well rinsed with water. Stain by carbol fuchsin on a hot plate for at least ten minutes, wash in 25 per cent. sulphuric acid, and counterstain with saturated solution of picric acid in water, or if other structures are to be shown, use 1 per cent. methyl green in preference to methylene blue. Both of these stains are preferable to the orthodox Ziehl-Neelsen, since they afford much better differentiation. The films cannot be too thin. These stains will show the "acid-fasts" brilliantly retaining the fuchsin. Other films should also be stained in the same way, but no alcohol should be used after the acid bath. They should have at least three washings with acid. Many of the "acid-fasts" will be found to be alcohol-fast as well, even so far as to be "colour true," i.e., they will not take up the counterstain. The picro-fuchsin is the more precise process. A great variety of bacteria, chiefly saprophytes, will usually be seen, but for the present purpose the acid-fasts only demand description. In a well-advanced case the acid-fast will at once be seen, in earlier cases they may require some patience. They are somewhat polymorphic, being long or short, thick or thin, solitary or fasciculated, straight or bent, but nearly always "beaded,"—i.e., not uniform in staining. In size and general appearance they strongly resemble both types of tubercle bacilli and in some films no difference can be found. Much of the variation in thickness is due to the fixing and staining; if heated too much they will swell up like rice or pop-corn, assuming various fantastic shapes; some may be distinctly "clubbed." Tinctorially and morphologically, they therefore closely resemble tubercle bacilli, which also are not infrequently amphophile to the Ziehl-Neelsen stain, and but feebly alcohol-fast.

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[1] *Journ. of Laryng.*, May, 1916, p. 184.

Cultivation.—So far they have resisted the orthodox methods, either aërobic or anaërobic, but by imitating their natural habits they multiplied slowly but freely, growing in felted masses resembling streptothrix. A sterile emulsion was first made from fœtid crusts, this was then mixed with Dorset egg medium and "planted" with crust material. Reinforcement by simply inoculating the "crusts" or by adding a few drops of sterile fœtid broth is generally successful in from five to ten days.

Inoculation Tests.—By the courtesy of the Lister Institute several series of guinea-pigs and rabbits have been inoculated. The research is far from complete and is being continued. The results so far obtained are, briefly, as follow: In September, 1915, Dr. Henderson Smith injected six guinea pigs with a reinforced emulsion (five days) made from a typical case of ozæna. No. 1 died during the sixth week, showing well-marked tuberculosis of the spleen. The five surviving apparently healthy guinea-pigs were killed during the tenth week. No. 2 revealed extensive caseation of liver, spleen, retroperitoneal and inguinal glands. No. 3 showed well-marked caseation of the inguinal glands, but the viscera were apparently unaffected. Nos. 4, 5, and 6 appeared to be quite healthy. Nos. 1, 2, and 3 were injected subcutaneously, Nos. 4, 5, and 6 intraperitoneally. Histological examination of the caseated foci showed characteristic tubercular lesions, there being giant cell systems with true tubercle bacilli, both intra- and extracellular. The bacilli were strongly alcohol-fast and of the slender type. Dr. Henderson Smith reported: "The smears from the spleen nodules and the glands both showed acid-fast bacilli very like tubercle. I have very little doubt they are tubercle. I was interested to find that you obtained histological tubercle in the sections." Emulsions were then made from the tuberculous viscera of Nos. 2 and 3, with which three guinea-pigs were inoculated on the day of the necropsy. No. 1 died in the eighth week, No. 2 died at the twelfth week, both showing extensive gland caseation with "bacilli both acid and alcohol-fast, obviously tubercular." Guinea-pig No. 3 was mislaid. Nos. 1 and 2 were injected subcutaneously, No. 3 intraperitoneally. In each group of tests those injected beneath the skin developed lesions, while the animal injected intraperitoneally escaped. There were no pulmonary lesions in any one of them, nor could any intranasal change be found. Excluding one animal which was lost, *five out of eight developed lesions which were indistinguishable from tubercle.* In each test the strictest precautions were taken against contamination at every step, from collection of the material at the hospital to the final necropsy.

A stage has therefore been reached which must not be considered conclusive, although collectively the evidence may be viewed as strongly presumptive. It has been established that certain organisms, morphologically and tinctorially resembling tubercle bacilli, are present in ozæna which we have never found in any other nasal disorder.

DISCUSSION.

Mr. HERBERT TILLEY: We should not allow this occasion to pass without expressing our thanks and congratulations to Dr. McKenzie, Mr. Mackeith and Dr. Wingrave for the excellent piece of work which they have done in connexion with the relationship between atrophic rhinitis and tubercle. Probably most of us have read their monograph which was published in the *Journal of Laryngology*, and since then when dealing with cases of atrophic rhinitis have laid more stress on getting all the details of the family history from the point of view of tubercle. In many cases I have been surprised to find such a history in the forebears. The question, however, has arisen in my mind whether, if we were to investigate the family history of any one of us here, we should not be able to find some relative who had had tubercle. But I think the percentage in cases of atrophic rhinitis would be greater than in any other form of nasal disease. I have carefully examined the cases exhibited to-day, and, with the exception of the little girl—who has not had many injections, and would scarcely yet be claimed as a success—the nasal cavities seemed to be in a very good condition. Presuming that they have had no other treatment, the result of the tuberculin injections has been, on the whole, better than in the other methods we have been in the habit of using. Perhaps it is as yet too early to speak of what the ultimate result is likely to be; but whatever may be the result, whether positive or negative, I cannot withhold my admiration for the useful work which these gentlemen have done.

Dr. WATSON-WILLIAMS: I should like to add my thanks for the monumental investigation which has been undertaken by Dr. McKenzie, Mr. Mackeith and Dr. Wingrave. It requires a great deal of enterprise to start an investigation on this subject nowadays, which has been the cemetery of many laborious hours; and we can only hope that their conclusions, which certainly seem warranted, will prove to be justified. No one has taught us more than has Dr. McKenzie himself to be very cautious in arriving at conclusions, and I think we cannot read these papers without feeling that they are the product of balanced minds. Dr. McKenzie has at least given us food for reflection, and has gone a long way towards leading up to some conclusive evidence in the treatment of the disease, the *bête-noire* of laryngology. He has so far carried me with him in his way of thinking that I shall give his methods a careful trial.

Dr. DUNDAS GRANT: I also feel very strongly, with those who have already spoken, that we have had here an honest endeavour to get further towards the truth of the conditions known as ozæna and atrophic rhinitis. A weak point in the work lies in the fact that Dr. McKenzie has taken the terms "ozæna" and "atrophic rhinitis" as identical. Ozæna without the peculiar smell is scarcely worthy of that name. Ozæna does certainly occur in subjects of pulmonary tuberculosis, though seldom; whereas chronic atrophic rhinitis with crusts, dryness, and pus, is common. If you put the two together under the heading of ozæna for statistical purposes, the result will be to invest ozæna as such with a degree of anxiety for the unfortunate sufferers from it which, I think, is not justified. I would remind you that for years the French have spoken paradoxically of an ozæna without smell, and they assert that, as a rule, "ozæna without smell" is generally tuberculous. It is probably lupoid in character, and might react to tuberculin. Apart from that, the results which have been obtained in the cases before us are worthy of every consideration. I should be glad if members would express their opinions as to whether ozæna and chronic atrophic rhinitis should be classed together for the purpose of drawing statistical deductions of either pathological or clinical import.

Mr. F. A. ROSE: I should also like to congratulate Dr. McKenzie and his colleagues on this excellent piece of work. I also want to ask a question. I am not clear, after reading the notes, whether it is claimed that these acid-fast bacilli are in the tissues of the nose, or only in the secretion inside the nose.

Dr. DAN MCKENZIE: I pointed out in my paper that we have never yet succeeded in finding these bacilli in the tissues of the nose.

Mr. F. A. ROSE: Assuming that the bacilli are present in the secretions only, is it not possible that they are there only by accident? A nose which is the subject of atrophic rhinitis is one which cannot protect itself from infection, so that all the bacilli in the dust in the streets may be deposited there. And if the patient only lives among enough acid-fast bacilli, there is no reason why those should not be found in the nasal secretions. We know that if a careful search be made for diphtheroid bacilli they are found in 90 per cent. of cases of atrophic rhinitis; and it is impossible not to find streptococci, staphylococci, and *Micrococcus catarrhalis*, and other organisms. The question is, what relation have these bacteria to the disease?

Dr. JOBSON HORNE (commenting on the statement in the paper, "It has been established that certain organisms, morphologically and tinctorially resembling tubercle bacilli, are present in ozæna which we have never found in any other nasal disorder") said: If I may be permitted, I would refer my listeners to the "Descriptive Catalogue of the Museum of the British Congress on Tuberculosis," held in London in July, 1901. On that occasion I was fortunate in bringing together a representative collection of cultures of bacilli, acid-resisting and morphologically and tinctorially resembling the tubercle bacillus. Amongst these was one isolated by Karlinski (Maglaj, Bosnia) from nasal secretion. Perhaps Dr. Wingrave will tell us whether the bacillus to which he refers has not been isolated before, or whether it is perhaps the same one which was isolated some years ago from the nose. The case for tuberculosis will stand or fall on the animal experiments, but they are, as the authors admit, far from complete, and must not be considered conclusive. Even a negative result will be valuable in elucidating the facts about ozæna. The question is whether this acid-resisting bacillus is merely an accessory to the crusts and discharge or whether it is a factor in the production of the disease. I am inclined to the former view.

Sir STCLAIR THOMSON: All research work is to be admired, even when the results are negative. I am not qualified to join in this debate, because I also have, so far, neglected to read these communications *in extenso*. But of the cases I saw in the next room none was free from suppuration, and more than one had the ozænatous odour. In connexion with tubercle I do not know whether it is of value to this debate, but I have had exceptional opportunities of seeing cases of tubercle, and for some years I have interested myself in a clinical research which I hope to publish some day: I mean the condition of the nose and pharynx in persons who have, or have not, tubercle of the larynx. I have quoted that there is a sort of *a priori* statement that the patient with stenosis of the nose, or other trouble in his nose or in the pharynx, is more likely to get tubercle, and tubercle of his larynx, than is anybody else. I see the throats of 300 tuberculous patients per annum, and I have been doing that for five years, and the result has been, to my surprise, that patients with tuberculosis of the chest or the larynx have got no more marked nasal deformity from disease than has the healthy individual, and that such affections of the nose as sinusitis or ozæna are no more common in sanatoria than they are anywhere else.

Dr. BROWN KELLY: I think we are indebted to Dr. McKenzie and his co-workers for so thoroughly investigating the nature and treatment of ozæna, our ignorance of which is not creditable. I regret that my own work on behalf of the International Collective Investigation of Ozæna has apparently come to nought. The only part which proved of practical benefit was that in connexion with the employment of a vaccine of Perez's bacillus. This vaccine is undoubtedly specific in some cases; it causes the fœtor to pass off, the nose to discharge more freely, and the crusts to disappear. Some of the cases which I treated in 1913-14 still remain cured. Perez's bacillus can be produced by injecting a mixed culture of ozæna crusts into the marginal vein of the ear of the rabbit. The animal usually dies in a day, and the bacillus can be recovered from the turbinals. If the animal survive, it has a chronic nasal discharge, and if it be killed later, the anterior turbinal is atrophied.

Dr. D. R. PATERSON: I have also taken part in a collective investigation into ozæna, and have received a definite impression of a connexion in family histories between tubercle and ozæna. I examined a large number of school children, confining my attention to cases in which the characteristic smell existed, and was struck by the frequency of the association. I have long noted the liability of ozæna patients to perish of tuberculosis.

Dr. DONELAN: Would it not be well for the Section to avoid using the term ozæna in cases where there is not the characteristic smell? Should we not speak of ozæna simply as a symptom occurring in atrophic rhinitis, or are we to run the risk of having it cropping up at every moment as an alternative disease? I understand we are dealing with atrophic rhinitis. Whether it be due to the bacillus as worked out by these investigators, or not, remains to be seen. Several of the cases shown to-day seemed to be at least secreting, if not actually suppurating, and one woman has the distinct ozænic symptom, and appeared to have some suppuration in the left sphenoidal sinus.

Dr. DAN MCKENZIE (in reply): On behalf of my fellow workers and myself, I thank those who have spoken for the very kindly way in which they have treated our attempt at research. The criticisms which have been expressed we not only expected, but have actually experienced in our own minds. I began this research with the idea that I should arrive at a negative finding. When I began I thought there was only an accidental connexion between tuberculosis and ozæna. As time went on, however, my experience brought me round to the belief that there is a real connexion between atrophic rhinitis and tuberculosis. And when I use the words "atrophic rhinitis" in connexion with this research, I mean ozænatous or fœtid atrophic rhinitis. The items in detail have been dealt with in our papers and there is no need to recapitulate the grounds for our belief. We are so convinced by our experience that we say we are content to leave the results of our research to time; we believe that in fifteen to twenty years general opinion will agree that ozæna is associated with tuberculosis in this respect, that they are part and parcel of one pathological process, that they are related as pathological entities. With regard to the point raised by Mr. Rose, as to those bacilli found in the crusts being due to accidental contamination from the air, that is answered by the fact that we have searched for this bacillus in other diseases with crust-formation and have not found it in them. It only occurs, as far as we have gone, in those which show the clinical signs of ozæna.

(*November* 3, 1916.)

Three Cases exemplifying some likely Common Causes of Cancer of the Throat, and some Facts about Treatment by Diathermy.

By W. STUART-LOW, F.R.C.S.

Case I.—A man, aged 52, who has been before this Section on two former occasions with a rapidly growing epithelioma of the soft palate. It began midway between the uvula and the base of the anterior faucial pillar, and rapidly and superficially spread to the uvula and middle line, and appeared so unusual that experienced observers mistook it for a syphilitic condition. When first seen in February, 1915, the growth was only the size of a sixpenny-piece, then it rapidly involved the anterior faucial pillar and uvula. Dr. Wyatt Wingrave pronounced the specimen removed to be a rapidly growing epithelioma. Pain has been very severe from early in the history of the case, and hard glands at the angle of the jaw also appeared early and caused an unusual degree of pain. The history of syphilis was proved, and the Wassermann test was positive. At our meeting in March attention was drawn to his habit of drinking scalding hot coffee. When he first came to the hospital his mouth was in a very septic state from septic gingivitis, dental caries, and pyorrhœa alveolaris. The chemical reaction of the fluids in the mouth and throat were distinctly acid. Dentition was defective. He has always taken a large quantity of common salt with his meals, and been a very heavy smoker. Two weeks ago all the uvula and palpably affected tissue were dissected away under a general anæsthetic, laryngotomy first having been performed and the larynx firmly plugged. The diathermy cautery was then freely applied to the surface of the exposed tissues, and punctures made into the freshly exposed parts at various spots. The method of diathermy puncture of malignant glands, first practised by myself, was then employed—viz., the hard mass of the glands having been exposed by freely reflecting the soft structures, the diathermy point was pressed into the glands repeatedly at various points, and the skin replaced and stitched up. Healing by first intention invariably resulted as in this instance.

Case II.—A man, aged 54, a railway guard at Basingstoke, was sent to the clinic a month ago. He only complained of increasing inconvenience in the throat and of some difficulty in swallowing. Pain was almost absent except at night, and there were no enlarged glands to be felt. The growth had affected the whole of the soft palate, which was largely destroyed, and what remained was sloughy and craggy when touched by the finger. It had also extended to the tonsillar region on both sides. The implication of the palate was very similar to that in the case just described, but the absence of pain and glandular involvement was in marked contrast. Wassermann's reaction was found to be positive, and there was a clear history of syphilis. He had always been a heavy smoker, often consuming 1 oz. of tobacco a day. The mouth was very septic from badly cleaned teeth, septic gingivitis, and large accumulations of septic tartar. The saliva was very acid. There were many carious teeth and dentition was defective, and he had always taken quantities of common salt with his food, and been fond of hot food. Three weeks ago laryngotomy was performed, and the larynx plugged, and the whole of the affected parts cut away; the tonsils which were affected being dissected out. Diathermy puncture was freely applied to the surface of the wound, and the point pressed into any parts that felt unusually resistant or firm on examination with the finger. A week later the diathermy puncture was again applied to a few sloughy looking parts. Dr. Wyatt Wingrave found the growth to be a rapidly growing variety, and a specimen is exhibited under the microscope. It is peculiar in showing many large glands in its structure.

Case III.—A man, aged 45, who came to the clinic last May, complaining of increasing difficulty in breathing; the history was that he had been affected and under treatment for six months previously. A large mass of fungating growth which proved to be epitheliomatous was seen to be implicating the right vocal cord and ventricular band. A low tracheotomy was performed. He was found to have a positive Wassermann reaction. He had a very septic mouth with acid reaction, and he had smoked a great deal. Diathermy puncture has been done, the laryngeal growth having been punctured regularly at intervals of a week both by the direct method and in the suspension position.

Diathermy has been proved to be very helpful in these cases and in a number of others in which it has been employed. It undoubtedly relieves the pain both internally in the throat and in the neck and head after puncture of the masses of glands by the method I introduced. It seems to be best to repeat the application at intervals of a few days, and not to apply it at any one time too extensively or severely. The growth is not only destroyed in places, but grows more slowly at the deeper sites where cure is not effected nor possible. Diathermy should be employed as early as possible in the history of such cases. In more advanced cases sloughy portions of the tumour are got rid of after the puncture, and in this way fœtor is lessened and sepsis of the mouth and throat diminished.

As regards contributory causes of cancer, syphilis has been present in every case that the exhibitor has investigated. Sepsis of the mouth, generally in an aggravated form, has invariably existed, and the saliva has been found to be quite acid in reaction, and excess of common salt has mostly been taken. Dental deficiency seems also to be a contributory cause, leading to the food being improperly masticated, and thus irritating or wounding the pharynx. It has also been noticed that these patients accustom themselves to taking very hot food.

DISCUSSION.

Dr. WILLIAM HILL: The results are very good. But we see the cases rather early, and it is desirable we should see them later as well. I have had some experience with diathermy, thanks to the work which has been done at St. Bartholomew's Hospital, and it seems to be very useful. But the plan of dealing with glands is not one upon which I have embarked, and I ask whether it is worth while to diathermize the glands, as Mr. Stuart-Low has done; I have only carried this out in my cases to relieve pain. I think it is better for the patient after these extensive excisions; he is more comfortable, and the scarring is not so great. But you must be prepared for tumefaction of the pharynx and trachea, although Mr. Harmer said he did not meet with this condition, which is one that may necessitate temporary tracheotomy. It is well to remember that in diathermy a little more tissue is always destroyed than is apparent at the time.

Mr. NORMAN PATTERSON: I think that in this case treatment of the glands by ordinary surgical methods would have been eminently satisfactory. It was not an inoperable case and removal by dissection was preferable to applying a cautery.

Mr. STUART-LOW (in reply): It is a method which I use after employing the knife first. By that means one is enabled to see exactly what one has done, and little harm is likely to result from the diathermy.

(*November* 3, 1916.)

A Braun's Artificial Larynx worn by a Patient for Five and Three-quarter Years in a Case of Laryngo-fissure for Epithelioma, followed by Complete Excision of the Larynx.

By Sir STCLAIR THOMSON, M.D.

THE patient, J. S. P., was aged 43 when he came under my observation in February, 1909. The record of his medical history is as follows: 1909—February 25, laryngo-fissure; May, stenosis started in glottis; November 28, tracheotomy; December 6, excision of larynx; 1915—November 5, gland in neck; 1916—August 18, died.

N.B.—No local recurrence.[1]

DISCUSSION.

Mr. E. D. D. DAVIS: I should like to ask whether members have had experience of Braun's tube. I have a patient of Major Waggett's under my care, who has worn a Braun's tube for about seven years, and he complains that saliva escapes into his trachea, causing violent attacks of coughing, so that the passage between the trachea and the pharynx is a disadvantage, and he has several times asked to have it closed. He speaks in a toneless whisper, which it is difficult for a stranger to understand, and speaking is laborious for him. The history of the case is interesting. In 1903 Sir Felix Semon did a laryngo-fissure. There was a recurrence in six weeks. Major Waggett and Mr. Stabb did a second and extensive laryngo-fissure three months after the first operation. He did well until 1907, and then Major Waggett and Mr. Stabb performed a laryngectomy, and he has worn a Braun's tube ever since. The result is very encouraging.

Sir STCLAIR THOMSON (in reply): The patient was able to breathe both through his mouth and through his neck, so he obtained a double supply of air. Indeed he was able to bicycle. When sitting at home and not wanting so much air, he put the stopper in his neck, and so had a good rough whisper speech. This tube also enabled him to enjoy a smoke. He did not complain of the tube leaking, and he lived a useful and happy life for five and half years. The question of recurrence is important. I did laryngo-fissure in February. The patient was getting some stenosis in his glottis by May. Sir Henry Butlin saw the case in consultation, and he could not make up his mind. But by

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[1] Case published in full in the *Brit. Med. Journ.*, February 17, 1912.

November the man had such a degree of stenosis that I had to do tracheotomy in a hurry. Sir Henry Butlin saw him again, and said: "Take out the whole larynx." I took it out, and the man did well. But when the larynx was examined pathologically, there was no evidence of malignant recurrence. (This was before the days of the Wassermann test. Later we found that the patient was an old syphilitic subject.) I still have the larynx, if any further investigations are required. This was a great blow to me, because tracheotomy would probably have done just as well. Sir Henry Butlin told me not to worry, as the man was probably much better without his larynx. Now, it is to be noted that five and a half years later this patient came back for cancer in the glands of the neck, in spite of excision of the larynx. But there was no recurrence in the throat. To his last day he breathed comfortably, dying of asthenia owing to recurrence in the glands of the neck. People who are not versed in laryngo-fissure say: "If a man has malignant disease at all in his larynx, take out his whole larynx." But here is a man who had his larynx taken out in very good time, yet that did not prevent recurrence five and a half years afterwards. Laryngo-fissure, in suitable cases, gives better results in cancer than any other operation; and the case shows that even a complete laryngectomy is not an infallible guarantee against recurrence.

(*November* 3, 1916.)

War Injury of the Nose to show the Result of Treatment for Stenosis caused by a Bullet Wound.

By Sir StClair Thomson, M.D.

Captain C. R. V. J. received a bullet wound in January, 1915, which penetrated the nose from the right to the left side. When he came under observation fourteen days later there was almost complete stenosis from adhesions between the septum and outer wall in each nasal chamber. It was also clear that the patient had a very deviated septum. On August 19, under chloroform, I performed a resection of the septum, which was very irregular, having evidently been comminuted by the bullet. Several pieces of cartilage were replaced, as has been my custom for many years. The adhesions were then divided, and rubber sponge plugs introduced. There has been some tendency to scar contraction, chiefly on the floor and roof, which is so common in the nose and larynx after these war injuries. This has been corrected by the persevering use of Lake's rubber splints, which the patient is still wearing.

(*November* 3, 1916.)

War Injury of the Nose to show Result of Treatment for External Disfigurement and Stenosis caused by Shrapnel Wound.

By Sir STCLAIR THOMSON, M.D.

LIEUTENANT F. H. B., aged 21. On May 17, 1915, while in a trench at Givenchy, a shrapnel burst over him and wounded him in the nose. I was asked to see him in consultation at the Chichester Hospital in June, 1915. The wound on the external nose had been so badly put together in France that the result was an unsightly disfigurement, as is well shown in the two photographs exhibited. There was no respiration through the left nostril, and the right was so occluded with adhesions that it admitted only a fine probe. In addition, the shrapnel had produced a condition like harelip, and a fracture of the superior maxilla. I suggested a plastic operation to Dr. D. Ewart, of Chichester, and a photograph, as well as the patient's present condition, will show how very admirably he carried out this delicate piece of surgery. The patient was transferred to my care in London in January, 1916. As the nasal respiration, although improved, was still unsatisfactory, the adhesions were divided under chloroform, and I found the septum so fairly plumb that it was left alone. Since then he has been persevering with the use of Lake's rubber splints, with the result that he has now a good thoroughfare, although there is still the usual tendency in these cases to some return of cicatricial stenosis.

DISCUSSION.

Dr. DAN MCKENZIE: I suggest diathermy in treatment of these adhesions. Has anyone tried to graft with cellulose? I thought those who have had experience with war cases might have tried it.

Dr. BROWN KELLY: I have seen five or six cases in which a bullet traversed the bony bridge of the nose without causing trouble. In others, however, in which the projectile traversed the lower part of the nose, almost hopeless damage resulted, owing to the inferior turbinates and septum being united. If these cases are not seen within ten days of being wounded, thick synechiæ form. I think that is one of the reasons why there should be rhinologists at the Front.

Dr. DUNDAS GRANT: The plan of treatment is so good, and it is so easily carried out in a number of cases, that there is scarcely any call for improvement upon it. After doing the submucous resection of part of it, I find ordinary cotton wool smeared with vaseline is good, and better still is a little indiarubber finger-stall put upon the blades of a Killian's long nasal speculum, pushed through and packed with gauze. It can be pulled out without the slightest discomfort.

Mr. HERBERT TILLEY: I should like to ask Sir StClair Thomson what are his reasons for preferring Lake's rubber splints. I have given them up for the past seven or eight years, because patients complained of neuralgia when these splints were used. I have since employed thin celluloid plates which cause no discomfort: they also leave room for nasal breathing, and prevent the opposing parts coming into contact. If the rubber splints are used because they are thicker, and givo support, I would suggest the use of a gauze wick wrapped round with oil silk: they can be made of a size to fit the part, mould themselves to the surroundings, and can be removed without any pain.

Dr. PEGLER: Those who can look back far enough will remember that what is called a Lake's splint was a later invention, and that for some years previously he used indiarubber sheeting, cut to required shape, and adapting thickness and size to suit the particular case. I employed them very successfully in a case of a soldier whom I showed early last session, who had had very bad traumatic stenosis, and had required two or three operations for its relief. If Mr. Tilley has had to complain of neuralgia in his cases, it is probably because there was a want of due proportion between the passage desired to be kept open, and the size, particularly the thickness of the splint. The adaptation must be perfect, neither too tight nor too loose; never loose enough to work back into the nasopharynx. How my confrères manage to cure synechiæ cases requiring lengthened treatment without such a splint of rubber I do not know. Lake's ready-made article, though occasionally one may find a size and shape adaptable to a special case, has never appealed to me, and I therefore make a point of keeping a stock of sheeting of various thicknesses by me, and cutting out the kind of thing I happen to require at the time.

Mr. J. F. O'MALLEY: It is necessary to leave in the substance used for ten days. I do not cut through with scissors, but get in Grünwald's forceps as wide as the nasal passage which is clear of the nasal synechiæ, and in that way one establishes the complete width of the nasal passages as they existed before, and then one applies a piece of rubber which is loosely fitting. [Dr. PEGLER: We all use Grünwald's forceps.] I avoid using a local anæsthetic previously, so as to ensure that one is dealing with the actual size of the nose.

Dr. WILLIAM HILL: Captain Hastings has contrived ingenious devices for these cases; he has made large use of ordinary hairpins with thin indiarubber tubing, attaching them to the forehead. This prevents depression of the nose.

I have been much impressed by the delicate work he has done in preventing deformity from both the tip and the bridge of the nose falling in. But there may be deficiencies which have to be supplemented by plastic flaps. Mr. Hern, dentist to the same hospital, has also some ingenious devices.

Dr. DONELAN: I should like to support what Dr. Pegler has said about india-rubber sheeting. For many years I have used it of the thickness of surgical gloves; in fact, in the hospital we use up old surgical gloves for this purpose. In treating synechiæ one can pack it exactly as wanted. Mr. O'Malley's suggestion of taking out the adhesion entirely with the forceps is an important element in the treatment. If you put in rubber sheeting, and pack nicely with gauze, the clearance is maintained; in two or three days you can take out the dressing and put in a fresh one, and so maintain the separation as long as necessary during healing.

Sir STCLAIR THOMSON (in reply): With regard to the cosmetic result in the second case, Dr. Ewart, of Chichester, is responsible for it. The patient was wounded at Loos, and his nose was put back on to his face so badly that he was almost hideous. He was engaged to be married, and his fiancée begged the hospital staff to take away some of the ugliness, and you can see in the photograph how excellent a result Dr. Ewart has achieved. With regard to the stenosis, the bullet went through high up, and much of the stenosis occurred at the top. There was a constant tendency to closure at the top, and I used Lake's splints simply because I was brought up on them! I have used a celluloid plate, but that was when the adhesions were *vis-à-vis*—one on the septum and one on the turbinals—and it was only necessary to keep the surfaces apart. I agree that Lake's splints are rather unpleasant—one patient has had to wear it since January, and the other a year. One patient had a splint made out of aluminium, and it acted admirably.

(*November* 3, 1916.)

Large Choanal Polypus removed through the Mouth in a Case of Suppuration of the Right Maxillary Antrum.

By Sir STCLAIR THOMSON, M.D.

THIS large growth was removed on October 25, 1916. The patient had noticed a polypus in her right nose for the last ten years, and it had been twice operated upon, under chloroform. The polypoid mass blocked up the right nostril, and hung down into the post-nasal space, below the level of the soft palate. It was plucked out through the mouth. The ethmoidal region appeared normal. The cause of previous failures is doubtless due to the fact that the right antrum had not been operated on. I found it full of fœtid pus.

DISCUSSION.

Dr. IRWIN MOORE: At the meetings of the Section, on May 7 and November 5, 1915, I reported in detail the case of a "Choanal Polypus originating in the Right Maxillary Antrum of a man aged 42."[1] Since the post-nasal portion of this polypus was fixed by inflammatory adhesions to the choanal margin, it was impossible to grasp and remove it by forceps, or snare through the nasopharynx. I therefore opened the antrum through the canine fossa, and removed with forceps first the pedicle, which was soft and necrotic, next the nasal portion through the anterior naris, whilst the projecting nasopharyngeal portion was removed through the mouth. This case supports the view first suggested by Killian that the maxillary antrum is nearly always the seat of origin of these polypi, also it shows that these growths may be subject to inflammatory and necrotic changes.

Dr. D. R. PATERSON: How young are the patients in which such cases occur? A fortnight ago I saw a child, aged 5, who was very ill with a large bulging swelling in the nasopharynx, and it was said to have been there only three weeks. Before touching it, as the breathing was much impeded when the patient was under a general anæsthetic, I did a tracheotomy, and then attacked it. I found it was fairly firm, and on puncturing it with a syringe I got nothing out of it. I passed up a post-nasal forceps, and twisted it out. It turned out to be a large nasopharyngeal polyp, originating in left nostril, but the parents seemed positive that there had been no symptoms of nasal obstruction until about three weeks previously. That it had been growing a long time was evident from the pressure effect on the left posterior naris, which was much enlarged.

Dr. BROWN KELLY: These polypi, which I think should be called naso-antral polypi, are common. If a polypus is present in the posterior part of the middle meatus, and, on snaring it, there is a discharge of translucent liquid from the nose, it is almost certainly a naso-antral polypus. These polypi are usually single; they may attain so great size as to hang down into the pharynx; and they occur in children, as Dr. Paterson has said. With very rare exceptions, polypi in children under the age of 10 come from the antrum. On removing these naso-antral polypi, no bleeding-point can be seen in the nose which would indicate their seat of origin. A misleading feature is that transillumination shows the antrum on the affected side to be brighter than on the presumably healthy side. Cysts of the lining membrane of the antrum are often associated with accessory ostia, and it is through one of these that the polypus escapes from the antrum.

Mr. FRANK A. ROSE: In answer to Dr. Paterson, I would confirm Dr. Brown Kelly's remarks. In my experience, a polypus in a small child is invariably single, and of the antro-choanal type. One exception to this occurred in a patient aged 9. With regard to the results of transilluminating the antra, the one on the affected side is frequently brighter than the other. I had the curiosity to take a patient back, after the removal of the polypus and transilluminate again; the antrum was then dark, on account of the blood which was escaping from the root filling the antrum.

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[1] *Proc. Roy. Soc. Med.*, 1915, viii (Sect. Laryng.), p. 104; also 1916, ix, p. 15.

Sir STCLAIR THOMSON (in reply): I am glad to have originated this discussion, because we have Dr. Brown Kelly here, and when I wrote the chapter in my book on this subject it was chiefly founded on his work and publications. I should have liked to have asked him and the other speakers whether it is necessary to do an operation on the antrum in these cases. This patient had fœtor and pus, and of course I did an endo-nasal operation. I have removed these growths from children, in whom I do not know whether there has been recurrence or not. [Mr. ROSE: Recurrence, in my experience, is uncommon.] I think there is no need to operate on the antrum unless it is diseased, or unless there is recurrence.

(*November* 3, 1916.)

Foreign Body in the Right Maxillary Antrum for Twenty-five Years causing Facial Neuralgia, discovered by X-rays and removed by Operation through the Canine Fossa.

By IRWIN MOORE, M.B.

PATIENT, a lady aged 67, was brought to me by Mr. Millican, L.D.S., of Surbiton, with a history of facial neuralgia for twenty-five years. While residing in the West Indies in 1891 she had a right upper molar extracted; this was followed by very severe pain under the right eye, from which she has never been entirely free. In 1897 she had a nervous breakdown, and a "lump" was said to have been felt over the right maxillary antrum, accompanied by much pain and tenderness. In consequence the remaining upper molars were extracted. In 1901 the patient came to England and consulted a throat specialist, without any benefit. She returned to the West Indies, seldom free from pain, with occasional exacerbations. In 1911 she went to New York, and had the right infra-orbital nerve resected. In 1913, while residing at Bexhill, following another acute attack of pain she noticed that the "lump" was loose and moved about. Recently she has been treated by means of alcoholic injections. In September, 1916, she consulted Mr. Millican, who extracted the two upper central incisors which were loose and

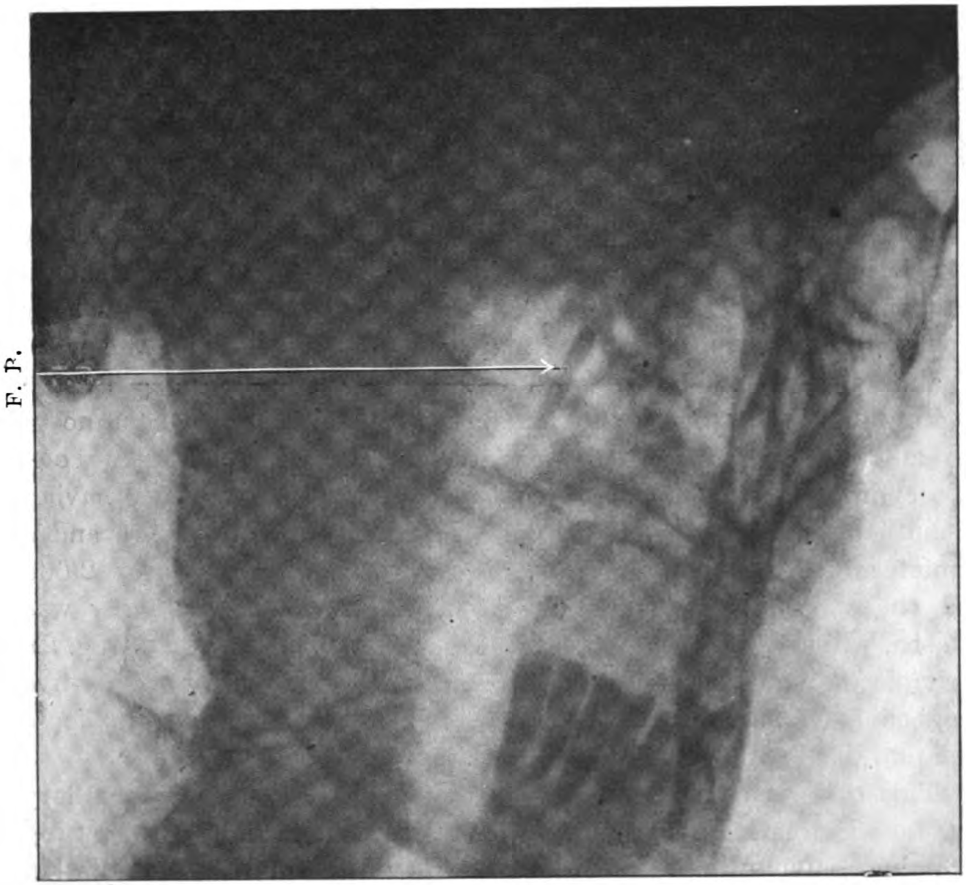


FIG. 1.

Radiogram showing the piece of metal in the right maxillary antrum.

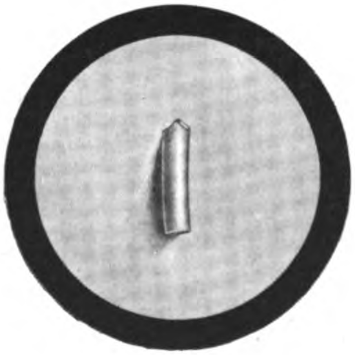


FIG. 2.

The piece of aluminium.

septic, and took her to Mr. Charles A. Clark to be X-rayed. The radiogram showed a foreign body in the right maxillary antrum lying against the nasal wall. It appeared to be cylindrical in shape, about 1 in. in length and ⅛ in. in diameter.

On October 12 I was asked to see the patient in consultation. There was no history of nasal catarrh or suppuration, and both nares were found to be perfectly healthy and normal. On inspecting the radiogram (fig. 1) it was apparent that a rod-shaped body was present in the right maxillary antrum and I advised that the antrum should be opened and a search made for the foreign body. Two days later I opened the antrum through the canine fossa and found the piece of aluminium now shown lying loose in the angle formed by the meeting of the posterior and inner walls. The lining membrane of the antrum was found to be perfectly healthy. The foreign body was cylindrical in shape, and consisted of pure aluminium, having a length of 1·34 cm. = 0·524 in. (just over ½ in. in length), and a diameter of 0·29 cm. = 0·135 in. The specific gravity was 2·666 and the weight was 0·24 grm. = 3·69 grains. One extremity was smooth, whilst the other appeared to have been cut by pliers (fig. 2). This piece of metal had apparently been buried or fixed for twenty-five years, and (as suggested by the patient's symptoms) only became loose and movable in the antrum three years ago.

This case is of great interest as showing that: (1) The maxillary antrum will tolerate a foreign body for twenty-five years without causing catarrh or suppuration, the usual accompaniment of foreign bodies in these cavities. (2) The shadow of this rod-shaped body could be distinctly seen when the antrum was transilluminated. (3) The appearance of the aluminium foreign body (according to the opinion of expert radiographers) was not compatible with its being metal. (4) Cases of facial neuralgia may be treated for years without any suspicion of being caused by antrum trouble. (5) The progress which has been made during recent years in radiography has proved of great service in the diagnosis and treatment of diseases of the accessory sinuses of the nose.

A stereoscopic view of the maxillary antrum by Mr. Charles A. Clark is shown, also the piece of metal removed.

Mr. P. MILLICAN (introduced by Dr. Irwin Moore): The trouble started after the patient had had her first right upper molar removed by an American practitioner twenty-five years ago. She has very large antra, and I believe that the anterior buccal root of that molar was in intimate relation with the antrum—possibly it projected into it. It is my opinion that, having discovered that he had made a passage into the antrum, the practitioner attempted to plug the socket with a piece of aluminium rod. This rod he found to be longer than was necessary, so he snipped off the excess with pliers while it was in her mouth—the mark of the pliers may be distinctly seen on the aluminium rod taken from her antrum by operation. This piece of rod escaped from his reach, passed into the antrum, and remained embedded there for twenty-five years. I should like to add (what is useful to note) that the patient suffered periodically two kinds of pain: one of a stabbing nature caused by the sharp ends of the foreign body irritating the mucous membrane of the antrum, and the other a "lump sensation," the site of which was variable.

(*November* 3, 1916.)

Sarcoma of the Right Maxillary Antrum; Lateral Rhinotomy performed (Moure's Operation).

By Irwin Moore, M.B.

Patient, a female, aged 50, was first seen on July 14, when she complained of swelling of the right cheek for six months, accompanied by considerable muco-purulent discharge from the right nostril. There was marked bulging outwards and upwards of the right maxillary antrum, some displacement of the right eye, and œdema of the lower lid. The right nasal cavity was completely filled with polypi.

Transillumination showed the right maxillary antrum to be opaque. X-ray examination by Dr. Finzi also showed that it was opaque, its upper outline ill-defined, and the bone at its upper part partly absorbed. The right sphenoidal sinus was absolutely clear (though it looked rather dark, this being due to a shadow across the cavity). Both ethmoids also appeared clear. Patient declined operation, but on account of the swelling increasing she was admitted to hospital on September 18, when a lateral rhinotomy was performed.

The growth, which appeared to have arisen from the right ethmoid region, occupied the greater part of the antrum, had penetrated its bony wall, and extended into the soft parts of the cheek, but had not yet infiltrated the skin. The floor of the orbit was intact, though somewhat roughened. The growth was thoroughly removed, together with the ethmoid cells and a portion of the muscular tissue of the cheek. There was no difficulty in controlling the hæmorrhage, and the skin incision

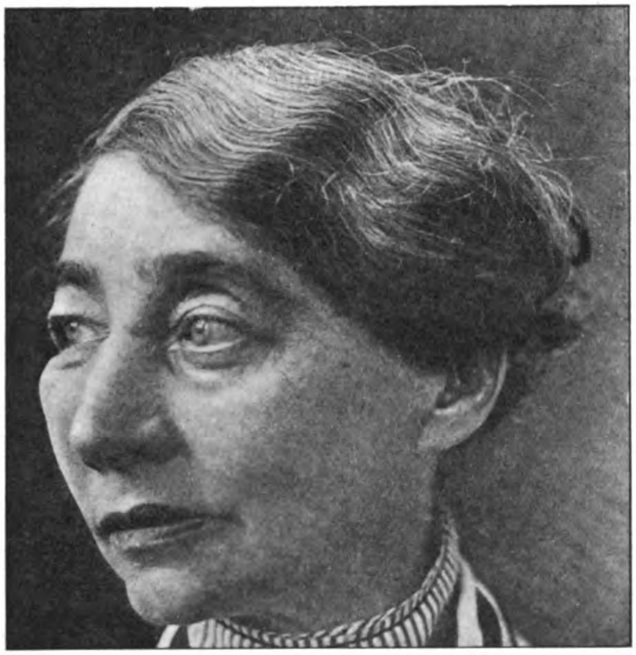


FIG. 1.
Sarcoma of the right maxillary antrum. Showing marked distension of the antrum.

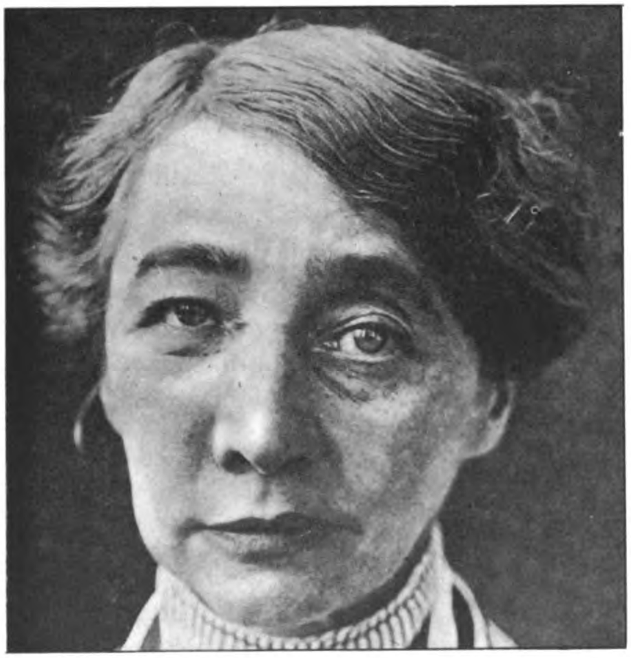


FIG. 2.
Sarcoma of the right maxillary antrum. Showing distortion of the face and distension of the antrum.

was sutured and dressed with strips of gauze and collodion. Healing occurred by first intention, the stitches being removed in four days. The œdema of the lower eyelid has not yet quite cleared up. The nose (now six weeks after operation) appears quite clean and healthy, and there is no discharge.

Microscopical Report.—The sections show dense masses of a round-celled tissue with a fibrous stroma. The cells vary in size, some of them are large, all possess large nuclei rich in chromatin. The growth is a small round-celled sarcoma, for several of the sections, evidently taken from the tissues outside the antrum, show striated muscle which is undergoing destructive infiltration by masses and lines of the round-celled tissue (Dr. Eastes' laboratory).

Radiograms by Dr. Finzi are shown, together with microscopic sections of the growth. The photographs show the swelling of the right cheek on July 7 and the increase in the growth during the following two months.

DISCUSSION.

Dr. W. HILL: In cases of doubt I recommend radium: in nine cases out of ten it acts like a charm.

Sir STCLAIR THOMSON: Recurrence can be best judged from the nose. It is a great thing to make a free opening into the nose. In cases like the two I published, in which the patients lived five and six years afterwards, you can pass the Eustachian catheter into the cavity and feel how it is lined with smooth mucous membrane. Interference with lymphatics leaves patients with a pseudo-œdema on the lower eyelid for three to twelve months, so it does not do to judge of recurrence by the outside appearance. Radium can be introduced to the original site, which is generally the ethmoid.

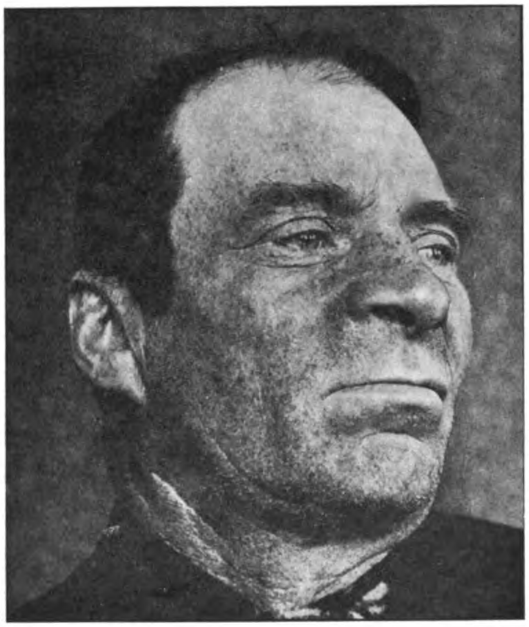
(*November* 3, 1916.)

Retention Cyst of the Nasal Floor.

By IRWIN MOORE, M.B.

PATIENT, a male, aged 53, first seen on September 12, 1916, complained of a growth on the right side of the nose and the adjoining portion of the cheek. The case is shown previous to removal by sublabial rhinotomy (Rouge's operation). Photographs and radiogram are also shown.

Note.—This case unfortunately could not be shown at the meeting, for while attending the dental department of one of the general hospitals to have some septic teeth removed before operation, the cyst was incised by the dental surgeon. Patient is now attending that hospital daily to have a gauze dressing inserted. I hope to show the case at another meeting, if and when the cyst re-fills.



Retention cyst of the nasal floor.

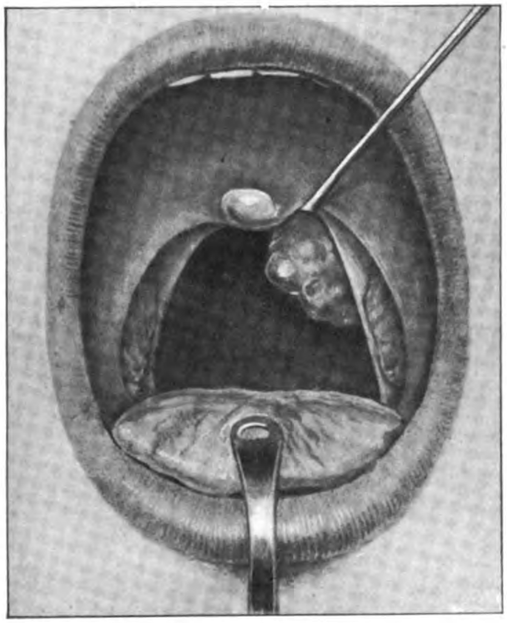
(*November* 3, 1916.)

Carcinoma of the Nasopharynx removed by Operation.

By Irwin Moore, M.B.

Patient, a female, aged 70, attended the London Throat Hospital on July 5, 1916, complaining of frequent attacks of inflammation of the throat for six months, together with dryness of the tongue. Three weeks previously she had felt discomfort in the throat, "as if there was something there," and on taking a deep breath she noticed a swelling behind the soft palate. On retracting the palate on the left side an irregular nodular growth was seen, which was of hard consistence and was attached by a broad base to the lower margin of the Eustachian cushion and lateral wall of the nasopharynx. Under an anæsthetic it was found impossible to draw a wire snare round the growth on account of its wide attachment, so it was removed in pieces by punch forceps, partly through the nose and partly through the mouth, patient being in the "hanging head position."

Patient now complains of shooting pains reaching from the left side of the back to the top of head. The left tonsil is seen to be enlarged, somewhat congested, and feels hard on palpation. This was, however, noticed the day following the operation, and does not appear to have increased in size. No enlarged glands in the neck can be felt, but the question of recurrence in the tonsil is a point on which opinions are invited.



Carcinoma of nasopharynx.

Histological Report of the Growth.—The specimen consists to some extent of lymphoid tissue, but this is invaded by a new growth having the structure of a carcinoma. The cancer cells are rounded and arranged in compact solid masses of varying size infiltrating the tissues.

There is a good deal of associated inflammatory reaction (Dr. Eastes' laboratory). Microscopical sections are shown.

A drawing from life is exhibited, showing the growth before operation.

DISCUSSION.

Dr. BROWN KELLY: I would suggest a trial of radium in cases of malignant disease in the nasopharynx. Dr. James Adam and I have published cases of very striking disappearance of growth after radium treatment.

Dr. W. HILL: At the Radium Institute a good deal is effected by means of small needles. Radium is introduced through the nostril and embedded in the growth and then passed behind. In one or two cases I have put it into the palate. The next day one may find the growth has disappeared over an area of ½ in. from the needle. I had a patient who was sent me by Mr. Horsford, and I wanted to send the case back after a couple of days that he might see it again, but there was no growth. Two or three days later there was evidence of scarring, even in the nose itself. It was an endothelioma, and extended to the level of the epiglottis. The usual result in carcinoma is not good.

Dr. IRWIN MOORE: I ask whether members think there is a recurrence of the growth in the left tonsil. The question is, whether this should be dealt with now, and enucleated.

(*November* 3, 1916.)

Case of Cystic Goitre.

By IRWIN MOORE, M.B.

PATIENT, aged 39. Enlargement of the thyroid began thirteen years ago during her first pregnancy. A year later she underwent an operation at the Metropolitan Hospital. Seven months ago the swelling recurred, and is now growing rapidly. She has occasional shortness of breath, otherwise no other disturbance.

(*November* 3, 1916.)

Two Cases of Fatal Wounds involving the Carotid Vessels and presenting Unusual Features.

By H. LAWSON WHALE, Captain R.A.M.C.

Case I.—Private S. was admitted to No. 13 Stationary Hospital on July 13, 1916, with a shrapnel bullet wound at the junction of the free margin of the right ala nasi and the cheek; there was no exit wound. Instantly on his admission there was a copious hæmorrhage from the mouth, from behind the palate. On inspection it was impossible to say from which side of the nasopharynx the blood came. Since, moreover, a probe showed that the direction of the bullet was towards the left mastoid, responsibility could not be fixed on the branches of one carotid more than on those of the other. Pressure on the common carotid, however, was much more successful in controlling the gush when made on the right side, so the right external carotid was tied forthwith just above the origin of the superior thyroid. His condition being too grave to warrant his transfer to the X-ray room, he was carried straight back to bed as soon as I had tied the artery, so that we were even yet ignorant of the position of the bullet. Within six hours he developed complete *right* hemiplegia, and without showing any reaction to stimulants, &c., passed through coma to death twenty hours after his arrival.

Autopsy.—The bullet had passed through both antra, and the nose, and then deeply to the left vertical ramus of the mandible. On impinging on the anterior surface of the left mastoid the intact shrapnel bullet had turned downwards deeply to the carotid sheath, and was lying exactly in the bifurcation of the common carotid. The common and external carotids were normal, but, from its origin up to the base of the skull, the internal carotid was completely thrombosed. This thrombus was continued into the left half of the circle of Willis, and into the middle cerebral artery as far as this could be traced up the Sylvian fissure. There was a sub-pial layer of red cortical staining over the Rolandic area. The necropsy showed nothing else noteworthy. On the right side the external carotid and its branches above the superior thyroid were naturally collapsed.

Case II.—Sergeant W. was admitted to No. 13 Stationary Hospital on July 16, 1916, with a shrapnel entrance wound one inch external to the left nostril, and an exit wound in the left sub-occipital triangle. The bullet had traversed the left antrum and mastoid. The skiagram gave no useful information. He had left facial paresis of infranuclear type, cerebrospinal otorrhœa, and fine horizontal nystagmus of the first degree on deviation to the left. He had no giddiness, vomiting, ataxia, atonia, nor dysdiadokokinesis. His superficial reflexes were sluggish. A slight diffuse swelling occupied the parotid and temporal regions. Hearing, by air or bone conduction, was absent on the left; temperature, &c., were normal. Ordinary cleansing and expectant measures were instituted. July 18: The temporal œdema had subsided, that over the parotid was harder, and was continued down the anterior border of the sternomastoid as a brawny mass. His pulse was 110, temperature 105° F. with a rigor, and four hours later 103·8° F., with another rigor. The pupils were equal, sluggishly reacting to light; and at no time now or subsequently did the fundi oculi show anything abnormal. July 19: Operation. Through the ordinary post-aural incision the outer shell of the mastoid (which was found cracked) was removed. The bullet in passing had smashed the facial "bridge," with the rest of the bony posterior meatal wall. The lateral sinus was laid bare with the chisel; no perisinuous pus was found, but the sinus wall was hard, pulseless, covered with shreddy granulations, and nearly black. Bone was cut away backwards until healthy sinus was reached (1½ in.), and downwards to the bulb. The insertion of a needle showed that the thrombus was only mural, not complete; and before putting gauze plugs between the dura and skull behind, and into the sigmoid sinus itself (which was slit open for this purpose), blood was allowed to flow for a few seconds. The internal jugular and common facial veins were tied in the neck. I did not turn out the clot between the ligature and the bulb. Subsequent history: For ten days there was a gradually diminishing flow of cerebrospinal fluid from the wound, the external auditory meatus, and into the mouth (? *via* the Eustachian tube). Besides ordinary dressings, &c., he was given Wright's antisepsis vaccine, and champagne. The cerebrospinal flow and the nystagmus slowly disappeared, and in all respects he steadily improved. But on July 26 the temperature and pulse became irregular, and his condition suggested septicæmia. A blood culture was made, and an autogenous vaccine of streptococci prepared from it. August 1: Hæmorrhage from the lowest angle of the post-aural wound, apparently from deeply in the parotid region. The patient only lost 4 oz. of blood, and the flow was easily stopped by pressure; but his pulse became thready, and he died within an hour.

Autopsy.—The lateral sinus was occluded back to the torcular. The straight, occipital, and superior longitudinal sinuses were healthy. The bulbar opening of the inferior petrosal sinus was well occluded. Brain: There was slight bruising of the *right* cerebellum and temporo-sphenoidal lobe (? by contre-coup). The wounds, both bullet and operative, were quite clean. The heart was much infiltrated with fat. The bullet, in traversing the left parotid gland, had completely severed the external carotid artery at the point of its final division into superficial temporal and internal maxillary. This hole in the artery was clean-cut, and from it there was a blood track up to the post-aural wound.

Comment.—There was never any indication that the bullet had involved any large artery. The clean and complete severance of the vessel, the track of the bullet, and the absence of macroscopic sepsis, made it clear to all who saw the necropsy carried out that this was not a case of secondary ulceration, but of direct trauma. I do not know whether the patient's life would have been saved if I had tied the artery when I tied the vein. Probably not, since he had a blood infection.

(*November* 3, 1916.)

Case of Carcinoma of Nasopharynx in a Girl, aged 17.

By W. M. MOLLISON, M.C.

F. C., AGED 17. A hard mass of glands in the left side of the neck; fixed, occasionally painful and tender. The tonsils and adenoids were removed at a London hospital six months ago. She was seen at Guy's Hospital in October, 1916. A small mass was seen in the nasopharynx, chiefly on the left side. This was removed mostly through the nose, but partly with an adenoid curette. To the naked eye the mass resembled simple adenoids, but section proved it to be a squamous-celled carcinoma (Dr. Nicholson). A section is shown.

(*November* 3, 1916.)

Laryngeal Case for Diagnosis.

By W. M. MOLLISON, M.C.

A. B., AGED 35, has been attending in the throat and ear department at Guy's Hospital for some months; he is hoarse and complains of a little pain at times. The left side of the larynx is swollen and fixed; the mesial surface of the swelling is superficially ulcerated. The Wassermann reaction has been negative at two examinations. No tubercle bacilli have been found in the sputum on repeated examination.

The exhibitor would be glad of suggestions as to the diagnosis and methods of treatment. Potassium iodide has been given, also arsenic and iron, without any effect.

Sir STCLAIR THOMSON: This appears to me to be a case of typical tuberculosis of the larynx. This patient has a fixed vocal cord, and there is an infiltration of the epiglottis, the left cord (with ulceration) and left arytænoid. This process, arising in three different parts of the larynx, could not be anything but tubercle.

(*November* 3, 1916.)

Double Abductor Paralysis.

By WILLIAM HILL, M.D.

THIS man had portion of a large goitre removed twelve years ago by two vertical incisions in the neck, and both recurrent nerves have probably been involved in deep contracting scars. It is noteworthy that only the abductor fibres are affected. Alarming attacks of laryngeal obstruction have occurred at times on exertion and more especially at night when he suffered from a severe cold. These attacks have become worse recently. The question is raised whether unilateral chordectomy and removal of the vocal process of the arytænoid will relieve the obstruction, and whether the voice will necessarily be reduced to a whisper, seeing that adduction is still apparently perfect. Good results have occasionally been reported following unilateral chordectomy, but not by well known laryngologists, as far as can be gathered. Suggestions are invited.

DISCUSSION.

Mr. F. A. ROSE: I was present at the operation undertaken for the relief of the paralysis of the vocal cord on a horse some years ago, and I helped Professor Hobday to operate. The result in that case was not such as to encourage doing the operation on the human subject; there was no material benefit to respiration.

Dr. DONELAN: I think that if the patient would consent to the loss of his voice there should be no difficulty about cordectomy, any more than there would be in respect of removal of cords in epithelioma of the larynx.

(*November* 3, 1916.)

Case of Recurrent Ulceration of the Mouth.

By H. LAMBERT LACK, M.D.

THE patient, a woman aged 20, has been under my care since May for repeatedly recurring ulceration in the mouth, which commenced last Christmas. She has had similar attacks ever since she had chicken-pox at the age of 10. All the previous attacks have been mild compared with the present one, and have lasted one to two months. Then there has been an interval of at least six months. The spots commence as lenticular or rounded ulcers, with a white sloughy base and surrounding inflamed area. They are very tender and slowly increase in size. So far as I have observed, the spots show no tendency to disappear, except under treatment; one spot which was untreated for three or four weeks attained the size of a sixpence, with a very thickened base. They occur on the mucous membrane of the lips, inside of the cheeks, gums, palate, and tongue. Three years ago they were found on the vagina. The treatment has been the local application of nitrate of silver, which has always seemed effectual, but not in preventing fresh attacks. The Wassermann reaction is negative. The patient is in excellent health otherwise.

Suggestions as to diagnosis and treatment would be welcomed.

Section of Laryngology.

President—Mr. T. MARK HOVELL, F.R.C.S.Ed.

(*February* 2, 1917.)

Case of Speech without the Use of the Larynx.

By E. W. SCRIPTURE, M.D.

THE patient, a girl, F. H., aged 18, has worn a tracheotomy tube since the age of 3. She breathes entirely through the tube; if it is closed or removed she begins to suffocate. With the laryngoscope the walls of the lower pharynx are seen to obscure the larynx. On retching, the larynx is raised into view. Apparently she cannot make air pass through the larynx. She can speak quite distinctly in a faint, almost toneless voice. It is of interest to inquire if the passage through the larynx can be reopened. There seems to be no fundamental reason why this should be impossible. If it is reopened, can the vocal cords be brought into action? If so, will the patient readily learn to speak normally, or will there be a conflict with the old method?

APPARATUS FOR THE GRAPHIC RECORD OF SPEECH.

Inscriptions of speech are made by the phonautograph method. The person speaks into a mouthpiece. The vibrations and puffs of air travel down a wide tube to a special recorder. The movements of the air are registered by a fine lever on a rapidly revolving blackened cylinder. The records are afterwards varnished.

Speech requires in the first place a supply of air with a difference in pressure before and behind some obstruction. Ordinarily the lung pressure is increased and the obstruction is formed in the larynx or the mouth. The patient shown uses the pharynx instead of the thorax. To produce "t," for example, she places the tip of the tongue against the front of the roof of the mouth in the normal way. Then she contracts the pharynx—as can be seen from outside—and compresses the air. When the tongue contact is released, a " t " is heard. She likewise produces all the occlusives, such as " p," " k," and the fricatives, such as " f," " th," " s," " sh," in a normal manner except for the supply of air. As the amount of air in the pharynx is very small, the sounds become weak in long phrases.

To produce a vowel, a vibrating body is necessary. This she obtains by raising the back of the tongue against the velum palati. When the air is compressed in the pharynx, she allows it to escape by slightly relaxing the tongue-velum contact in such a way that the contact edges vibrate. The tongue-velum contact thus forms a pseudoglottis. The different vowels are produced by adjusting the mouth cavity.

The patient can even indicate differences of pitch, though in an imperfect way, as in singing " ah-ah-ah-ah " on four notes of an octave.

This girl has never received any instruction in speech, and has evolved this method of talking quite automatically.

DISCUSSION.

Mr. HERBERT TILLEY: Dr. Scripture says in his notes: " There seems to be no fundamental reason why this should be impossible," i.e., the reopening of the larynx. The case illustrates what is the not uncommon but evil result of doing a high tracheotomy, or, more strictly speaking, a high laryngotomy. This patient seems to have had the tube inserted in the cricoid or thyro-cricoid region, with the usual result—viz., excessive formation of granulation tissue followed by cicatrization with eventual blocking of the lumen of the air-way. In University College Hospital there is at the present moment a boy who has been there four months for the treatment of this same condition. Under an anæsthetic we could pass only the finest Lister's urethral bougie from the tracheotomy wound through the larynx. We substituted a low, for the previously high tracheotomy. Laryngofissure was then performed. In the subglottic region I found a passage admitting only the small steel bougie. We dissected out some fibrous tissue, and then inserted a small intubation tube, leaving in also the low tracheotomy tube. The child was then able to breathe through the tracheotomy tube as well as through the intubation tube; the intubation tube has now been in, on and off, for four months. We have dilated the stricture so that it is now possible to insert a full-sized intubation tube, and to dispense with the tracheotomy tube for increasing periods of time. If we leave out the intubation tube for three days, the stridor recommences, and we have to re-intubate. I think we shall be able to continue with the intubation tube until the child has grown a little more, and then dispense with it altogether. If not, the question will arise as to whether we can turn in some skin flaps or graft the narrowed area of the laryngotracheal region. Perhaps Dr.

Scripture's patient has a narrow stricture of the subglottic region, and as she has had it for fifteen years it will mean that whoever treats the condition must be persevering, for it will probably occupy many months. Examination should be made by the direct method, to see what the glottic and subglottic regions are like, and then exploration from below to ascertain if there is any passage from the trachea through the subglottic region into the lower throat. It may be necessary to split the larynx and cricoid, to remove any obstructive or redundant masses of connective tissue, and to determine the possibility of either dilating the stricture by intubation tubes or by instituting some plastic operation which shall prevent future narrowing of the air-way. My hospital patient has a good voice when the intubation tube is removed.

Dr. W. HILL: It is a difficult matter to undertake a case such as that described by Mr. Tilley. The treatment may extend over two years, or even four, and the result is often disappointing. In one of my cases, in spite of the use of an intubation tube for six months, the tracheotomy tube had to be re-inserted after all apparatus had been dispensed with for a few weeks, and I gave the case up in despair, as far as dilating the strictured larynx was concerned. I am aware, however, that some good results have been recorded in such conditions. If the larynx grows and one can get a wider passage, the functional disability may possibly be reduced to a minimum.

Dr. W. H. KELSON: Why is it said that apparently no air passes through the larynx? The voice she has probably indicates that a very little air does pass that way. Some years ago I showed here the case of a man who had cut his throat above the larynx, causing a big aperture, and in that case the man could not speak at all when the opening was exposed. But when it was covered with the hand or with a handkerchief he could speak well, showing that the larynx played a minor part in the act of speaking.

Dr. SCRIPTURE (in reply): The patient cannot get air through the larynx. She collects air in the back of the pharynx and then squeezes it out with the muscles of the neck. When the tube is closed she begins to suffocate.

(*February* 2, 1917.)

The Relation of Peri-dental Gingivitis to Vincent's Angina.

By FRANK E. TAYLOR, M.D., and W. H. MCKINSTRY, M.B., Captain R.A.M.C.(T.).

THAT ulcero-membranous inflammatory affections of the buccal cavity may be widely distributed on the mucous membranes of the mouth and gums, and not merely confined to the pharynx and tonsil in accordance with the classical descriptions of Vincent's angina, has been recognized by many observers since this was pointed out by Vincent himself in 1898. In addition to an ulcero-membranous pharyngitis and tonsillitis (Vincent's angina) he described an ulcero-membranous stomatitis and an ulcero-membranous gingivitis. In all these conditions, two or more of which are not uncommonly seen in the same patient, he found that the same micro-organisms were present—viz., the spirillum and *Bacillus fusiformis* of Vincent. Although Vincent's name is usually associated with these organisms, they would appear to have been first seen and described by Miller, an American dental surgeon practising in Berlin in 1882.

At the Queen Alexandra Military Hospital, during the last few months, we have bacteriologically examined nearly 300 cases of fuso-spirillary infection of the mouth, and have abundantly confirmed the previous findings of the constant presence of these organisms in all forms of ulcero-membranous inflammation of the mouth, either alone, or associated with various forms of cocci, bacilli, and leptothrices.

In addition to the diffuse ulcero-membranous gingivitis previously described by Vincent and others, which is frequently found in association with Vincent's angina, there is also frequently met with a more restricted infection of the gums with these fusiform and spirillary organisms, in which the lesions are limited to those parts of the gums which are in immediate contact with the necks of the teeth. This condition constitutes, we believe, a distinct clinical entity, and may accurately be designated "fuso-spirillary peri-dental or marginal gingivitis"—a condition which was named and fully described by us in a paper read before the Odontological Section of this Society on November 27, 1916.[1]

In addition to its prevalence, this affection is of additional interest and importance in that it is often confused with pyorrhœa alveolaris, although it differs from this condition in the absence of pus and pus-pockets. Further, the treatment, course, duration, and prognosis of these two affections are essentially different.

In our earlier examinations of cases of Vincent's angina the investigations were restricted to the ulcero-membranous lesions of the pharynx, and to the differential diagnosis of the condition from other ulcerative membranous infections, particularly diphtheria and syphilis. Later the ulcero-membranous lesions were found not to be confined to the pharynx, and many cases of fuso-spirillary gingivitis were observed, often associated with the typical Vincent's angina. It is, however, the restricted peri-dental or marginal gingivitis which we have particularly found associated with Vincent's angina, although in a few cases the accompanying gingivitis was of a more diffuse character.

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[1] *Proceedings*, 1916-17, x (Sect. Odont.), p. 8.

Since our attention was first directed to this association of peri-dental gingivitis and Vincent's angina, we have made a systematic examination of the gums in seventy cases of Vincent's angina, and in every case, without a single exception, we have found the gums to be affected, the condition in the great majority of these cases being a localized peri-dental or marginal gingivitis. Conversely, out of 150 cases of fuso-spirillary gingivitis, the characteristic lesions of Vincent's angina have been present in the pharynx or tonsil in seventy cases. In all these cases the clinical findings have been confirmed by careful bacteriological examination.

An investigation of the histories of these cases shows the same sequence of events in them all—namely, that the gums were always infected first, and that the sore throat was the more recent condition, having been infected, it would seem, from the gums. In many cases the patients themselves would make no complaint of the gums, but on inquiry it would be found that the gums had been sore and bled more or less freely whenever an attempt was made to use a toothbrush or clean the teeth. This condition of the gums may have been present for days, weeks, or even months, and in a few cases years, before infection of the tonsil or pharynx supervened. In some of these chronic cases of peri-dental gingivitis the patients had repeatedly suffered from attacks of sore throat, and examination in these cases usually revealed evidences of old ulceration of the tonsil or pharynx, with loss of tissue, deep crater-like depressions in these organs being often found. In this connexion the following are interesting and instructive histories:—

Case I.—Second-Lieutenant D., Lovat's Scouts, presented himself for treatment suffering from Vincent's angina of the left tonsil. Peri-dental ulceration of the gums was also present about the lower incisors. The teeth were sound, clean, and in good condition. After two weeks' treatment by the topical application of an alkaline solution of salvarsan, the throat was quite healed, and the condition of the marginal gingivitis was much improved, though slight bleeding of the gums when touched still persisted, and fusiform bacilli were still present, though in greatly reduced numbers. Owing to the fact that he was then recalled to his regiment no further treatment was undertaken. About the middle of November the right tonsil became sore and painful. The regimental officer applied boroglyceride, tincture of iodine, and other solutions without success, and so referred the patient back to us on December 5. We found a deep ulcer on the right tonsil, and a relapse of the peri-dental ulceration about the lower molars. Smears made from both the throat and the gums showed the usual picture of fusiform bacilli and spirilla. Swabbing the throat and gums with salvarsan solution was again regularly undertaken, and by December 18 the throat was completely healed. On December 22 the organisms had disappeared from the alveolar margins, and there has been no recurrence either on the pharynx or the gums.

Case II.—Private B., A.I.F., complained of sore throat, and two deep ulcers were found on the right tonsil. A soft whitish membranous exudation covered the ulcerated surface, and could readily be removed with a throat swab or platinum loop. This slight manipulation was sufficient to excite somewhat free bleeding. The throat had been sore for two days, and great pain on swallowing was experienced. The breath was very fœtid, and the lymphatic glands beneath the left angle of the lower jaw were swollen and tender. The gums also showed peri-dental gingivitis about all the lower incisors, and on examination it was found that bleeding of the gums had been present for the last two years. The teeth were in good order, the first and second left upper molars having gold fillings. Smears from both gums and throat showed the presence of fusiform bacilli and spirilla. The teeth were thoroughly cleaned by the dentist, and the gums and throat were then painted daily with salvarsan solution. By November 23 the condition of the throat was greatly improved and no bleeding occurred on instrumentation of the gums. On December 6 the throat was well and the gums were nearly healed. On December 15 both throat and gums were free from Vincent's organisms.

Case III.—Private C. was sent for the bacteriological investigation of a sore throat of four days' duration. An ulcero-membranous inflammation of the right tonsil was found. The gums, he stated, had been tender and bleeding for a week. Smears prepared both from the tonsil and the tooth margins of the gums showed the typical *Bacillus fusiformis* and spirilla. In ten days the throat was healed and free from these organisms, and a week later the peri-dental gingivitis was healed, and the tooth margins of the gums were free from these organisms.

Case IV.—Captain K., R.A.M.C., complained of sore throat of three days' duration, and of bleeding sore gums of three weeks' duration. The sore throat was a typical Vincent's angina, and the sore gums typical peri-dental gingivitis. The characteristic organisms were present in both conditions.

These few cases may be taken as examples of many which we are encountering daily, and the histories of the cases keep repeating the same sequence of events with monotonous regularity—first there are bleeding sore gums, which may, or may not, have been diagnosed as pyorrhœa, and which may have been present for some considerable time, and then the throat becomes affected and the typical ulcero-membranous pharyngitis and tonsillitis of Vincent's angina is seen. The diagnosis is confirmed by finding the typical organisms in both conditions.

Our experience has been confined to adults, but Vincent's angina is also seen in children, and it would be interesting to learn if the same frequency of peri-dental gingivitis is observed in association with Vincent's angina in children, and whether the same sequence of events—viz., the peri-dental gingivitis preceding the Vincent's angina also occurs in them.

As the result of our investigations we suggest that when a patient complains of a sore throat which presents the characters of Vincent's angina, it is essential to examine carefully the tooth-margins for evidence of peri-dental gingivitis, or conditions diagnosed as pyorrhœa, and that smears be made from both sources and examined microscopically for the detection of the causal micro-organisms. When these are found to be present the peri-dental gingivitis should be adequately treated as well as the Vincent's angina, otherwise the condition is likely to persist indefinitely, or to cause repeated recurrences of the sore throat.

Our thanks are due to Mr. J. C. Potter, laryngologist to the Queen Alexandra Military Hospital, for sending us many of the cases, and confirming our results, and to the Commanding Officer, Surgeon-General J. Dallas Edge, C.B., A.M.S., for permission to publish them.

DISCUSSION.

Dr. DAN MCKENZIE: The association of peri-dental gingivitis and Vincent's angina seems to add one more lesion to the number already described in which this organism is present in large numbers. If Dr. Wingrave had been present he would have been able to discuss the matter, as he has devoted attention to it for many years. He has also found the organism of Vincent's angina in ear discharges, and in one or two brain abscesses. In a case I reported here the organism was found by him in the cellulitis of the neck following upon an operation for tonsillitis and adenoids, which proved fatal. Though it is present in large numbers in these lesions I do not think that its pathogenicity has yet actually been established. It is found normally in the mouth, and the question is as to what is responsible for the conversion of the organism from a harmless parasite into a factor in a troublesome lesion. Dr. Wingrave believes both the fusiform organism and the spirillum to be modifications of one species.

Dr. WATSON-WILLIAMS: May a too free brushing of the teeth with a stiff brush cause an infection of the gums by producing abrasions? A number of cases of pyorrhœa alveolaris are possibly due to this cause. Less vigorous brushing is often desirable, whereas the contrary is frequently urged.

Dr. W. HILL: How many typical tonsillar lesions has Dr. Taylor seen associated with this special type of Vincent's disease? We do not often see it. Several of my cases seen before the War were soldiers living in camps.

Mr. O'MALLEY: Has Dr. Taylor made any sections showing cellular changes in the tissues due to the activity of the organism mentioned? I have removed tonsils in which a similar condition existed, and the report I received was that the tissue changes showed an excessive amount of lymphoid cells, a small-celled infiltration, in the parts surrounding the ulcerated areas.

Dr. FRANK TAYLOR (in reply): We have seen more than 300 cases of infection by these organisms, and in every case, in our experience, the lesion has been limited to the buccal cavity. With regard to the presence of these organisms in a healthy mouth, one is tempted to ask, What is a healthy mouth? Even in well-groomed mouths we occasionally see fusiform bacilli and spirochætes, but the microscopic picture of the film from such a condition is quite different from that in which there is an infection. In the former case the films require much searching to detect the organisms, while in the latter there are masses of them. There is a difference of opinion as to whether these are two distinct organisms, or whether they are different stages of the same. We have actually found evidence of infection in toothbrushes, and in several cases we have associated the infection with the use of such brushes. In the last few months we have seen about 150 cases of Vincent's angina. We have not had the opportunity of making sections of the gum tissue, because the effect is the reverse of a hypertrophy, so that there has been no redundancy of tissue to remove.

(*February* 2, 1917.)

Four Cases of Laryngofissure for Epithelioma of the Larynx, shown at Intervals of Three and a Quarter Years, Two and a Quarter Years, Ten Months, and Three Months after Operation.

By Sir STCLAIR THOMSON, M.D.

Case I.—Laryngofissure three years after operation. Captain H. O., now aged 61, had been hoarse for twelve months when he presented himself on October 17, 1913, with a cupped growth occupying the posterior half of the right vocal cord. The cord moved freely. The Wassermann reaction was negative and there were no tubercle bacilli in the sputum. The projecting portion of growth was removed by the indirect method with Mackenzie's forceps, and reported to be an undoubted squamous-celled carcinoma. November 10, 1913 : Usual laryngofissure ; tracheotomy tube removed at end of operation. Microscopic examination revealed structure of typical squamous epithelioma, not invading the muscle planes and showing a margin of healthy tissue all round. The patient's excellent voice is remarkable.

Case II.—Mr. F. H., now aged 71. This gentleman has already allowed himself to be examined by the Section three times. He was first shown on November 6, 1914, before operation, with the whole of the left cord replaced by a red, knobby, ulcerating infiltration. The cord moved well. The infiltration was not suitable for removing a portion for microscopic examination, and the diagnosis therefore depended entirely on the naked-eye appearances and exclusion of other possibilities. It will be remembered that the microscopic examination of the growth, removed by a first laryngofissure on November 12, 1914, suggested that the growth had spread close up to the line of excision in the posterior subglottic region. A second laryngofissure was therefore performed on November 20 (i.e., a week after the first) and the patient was shown to the Section a fortnight later (viz., December 4, 1914). The tracheotomy tube was removed at the end of the operation on each occasion, and, as will be seen by the dates of his appearance before the Section, his recovery each time was rapid. He again allowed himself to be exhibited before the Section for a third time on November 5, 1915.[1] The patient has not been seen for a year, but when last inspected he had an excellent voice and no trace of recurrence.

Case III.—Mr. E. N., aged 68, was sent to me by Mr. Johnson Taylor, of Norwich, who had diagnosed malignant disease of the larynx. The anterior four-fifths of the left vocal cord were replaced by an ulcerating, raised, indolent, pale pink infiltration, slightly white in the centre. The cord moved freely. April 4, 1916: The usual laryngofissure was carried out in the presence of several Members of the Section. The operation was practically bloodless and no vessels were tied from the beginning to the end of the operation. It occupied one hour. The tracheotomy tube was removed before the patient left the table. He was sitting up reading the paper in bed the same evening, and next day was out of bed and eating solid food. The microscopic examination revealed an undoubted epithelioma and that the excision was well clear of the growth.

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[1] *Proceedings*, 1916, ix, p. 6.

Case IV.—Commander F. I., aged 57½. The history of the onset of this patient's trouble is very interesting. He consulted Dr. W. R. Gibson, in Madras, who found a "papilloma" between the anterior ends of the vocal cords together with slight ulceration of the right vocal cord. This papilloma was about the size of a green pea. The diagnosis lay between papilloma and malignancy. The patient was advised to return to England at once for advice and possible operation. *En route*, about three weeks before coming under observation, he had an attack of acute tonsillitis, with much pharyngeal straining and his voice suddenly became "perfectly all right." About this time he brought up some blood on one occasion, but is not aware of having ever coughed up anything special. The patient was referred to me by Mr. G. Jackson, of Plymouth. On October 12, 1916, he presented himself with an almost natural voice, yet it was found that the anterior two-thirds of the right cord were occupied by a red, beefy, abraded, shallow infiltration. The cord moved freely and the condition was not suitable for removing a portion for examination. The diagnosis therefore rested entirely on clinical appearances and the exclusion of other factors. October 13, 1916: The usual laryngofissure was carried out in the presence of several Members of the Section. The tracheotomy tube was removed at the end of the operation. Patient was sitting out of bed and eating solid food the next day. He left the nursing home at the end of twelve days. The patient has not been seen since and therefore the present condition cannot be reported on.

DISCUSSION.

Dr. WATSON-WILLIAMS: The results in these cases are excellent. In the operation for laryngofissure I consider the preliminary injection of cocaine, before making the incision into the larynx, very useful in abolishing the cough reflex which may cause so much inconvenience. Dr. Irwin Moore has recently introduced improved or new instruments, such as the new saw and shears for dividing the cricoid, &c. Amongst Sir StClair Thomson's cases we find one where there is an apparent growth with appearances suggesting innocency, and in an unusual situation for a malignant growth of the larynx—namely, in the anterior commissure. Hence we ought to reconsider the view which has been put forward, that if the anterior third of the vocal cord is occupied by a growth it is far less suspicious of malignancy than if it is in the posterior half. It does not seem that location is a guide as to the character of a growth.

Dr. D. R. PATERSON: The whole operation, as carried out by Sir StClair Thomson, is a very satisfactory procedure. It has been much simplified in technique, and altogether it is one which is more desirable than it was formerly. One of the points upon which Sir StClair appears to lay stress is that it is a practically bloodless operation on account of the use of local anæsthesia. Of course he has been fortunate in getting the cases at so early a stage, and the lesson these cases teach is that we should try to educate the profession generally not to allow cases of hoarseness to run on in the way they are permitted to do, and that hoarseness may indicate a serious condition, which the sooner it is tackled the better.

Mr. BADGEROW: I have seen a number of cases upon which Sir StClair Thomson has operated in the last eighteen months, and three points particularly impressed me: (1) The operation is practically bloodless; (2) there is little, if any, shock—the patient is well the same evening, and next day is sitting up; (3) the voice is exceedingly good. I ask whether Sir StClair expects, in the case operated upon three months ago, a better voice than the patient has now, which I consider very good.

Dr. JOBSON HORNE: In commenting on the fact stated in the notes that in all four cases the affected cord "moved well" or "moved freely" at the time the patient came under observation, may I say that is not in accordance with general experience in cases of malignant disease of the larynx. It shows that the growth has not infiltrated the subjacent intrinsic muscles, and it also shows that an early diagnosis is everything in obtaining a good result from the operation.

Dr. W. HILL: Everything goes smoothly, and there is very little bleeding in this operation, as carried out by Sir StClair Thomson. It appears to be followed by little shock if not done with violence. Much of his success is probably due to the fact that he does not put the patients in the Butlin posture afterwards, but makes them sit up at once. Butlin's posture does not, as the originator hoped it would, prevent the septic secretions going down into the lungs, and if the patient has a weak heart, there may ensue œdema of the lungs, and in one of three cases death has resulted. In Sir StClair Thomson's cases there are no complications, so far as I can ascertain. These cases of his were most suitable for operation—the lesion not too large, but just large enough for easy diagnosis. In some of my cases, when I first saw them, invasion of the pharynx, and occasionally of the œsophagus and the mediastinal glands also had occurred, so that operation had no chance. Though I do not depreciate the value of his technique, yet I think his after-treatment is even more important.

Mr. FRANK ROSE: I should like to confirm Dr. Hill's remarks about the attitude in which these patients should be placed after the operation. I have tried keeping the patient lying down with the head very low; I have also adopted the method of making the patient sit up immediately after the operation, and I have no doubt that the last named is the better method—he is more comfortable, and gets better more rapidly.

Dr. DAN MCKENZIE : I ask Sir StClair, as I have asked on previous occasions, as to the advisability of removing a piece of the growth before operating. In one of these cases a projecting portion of growth was removed, but in the other cases no portion was removed because "the infiltration was not suitable." I would ask when it is suitable, and how we are to tell.

Sir STCLAIR THOMSON (in reply) : It is striking that not one of the four cases shown this afternoon had fixation of the cord : it is very important to remember that. Yet I had a case in which flagging of the cord was the only suspicious symptom. It does not always mean that the case is advanced ; the case I have in mind was in an early stage. In two of to-day's cases the growth was on the anterior four-fifths of the cord. The old idea that malignant disease selects by preference the posterior aspect of the glottis is, in my experience, quite a mistake. Perhaps the growths in half my cases were more in the anterior than in the posterior half of the larynx. With regard to previous removal of a portion for examination, in one case where a piece was projecting there seemed no reason why I should not make assurance doubly sure, but this is not my usual practice ; one might nick a piece of mucous membrane, the effect of which might be to stir up the disease. Of course part of the success has been due to the fact that I know when to hold my hand. That is shown in the case which Mr. Trotter will tell you of presently. I saw it was not suitable for laryngofissure, so I turned it over to him. Though Dr. Hill has seen some of my most favourable cases, I have had others which have been troublesome. In one or two I had to split the cricoid as well as the thyroid, and these are the more serious cases, because we get recurrences among them, though some have remained indefinitely without recurrence. Mr. Badgerow spoke of the absence of shock, and I have asked myself why. I show you a typical chart. The patients are operated upon at 9 in the morning, and at 6 p.m. the same day they are sitting up in bed reading the evening paper. Nearly all are out of bed the next day. I think this absence of shock is due to the use of cocaine before the operation. The skin is injected with eudrenine beforehand, and for some years past I have also made an intratracheal injection of cocaine before doing the tracheotomy : it seems to abolish the shock, and there is no coughing. It makes it as quiet and bloodless an operation as septum resection. Some of the patients have left London again within a fortnight. I do not know how I came to adopt this position for patients, because twenty years ago the teaching of Butlin, which was largely followed, was to put the patient low in the bed, and he was not allowed to lift his head, so that he lay there slobbering in blood and mucus, which he was unable to cough up, and the blood and mucus were sucked down into the lung. My first experience of the sitting-up posture was in a German in whom the anæsthetic was not given elegantly, and blood got into the base of the lung and produced consolidation. He refused to lie down after the operation, and he got well because he sat up and spat the blood up! The only improvements I feel I have made are merely simplifications. Dr. Irwin Moore, to whom I am deeply indebted for details connected with these operations, injects the patients' skin an hour before the operation at 9. This is one of the reasons why the operation is so bloodless. It is a question of having all the preliminaries well done, not hurrying the operation, and taking care to restrict beforehand any indulgence in tobacco and alcohol, and having the blood-pressure determined. One man thus operated upon had double aortic trouble, albuminuria and cirrhosis of the liver, yet his operation went as smoothly as in any other case: he was thoroughly prepared for five days beforehand in a nursing home. We occasionally meet with a growth which is semi-pedunculated. The second patient was a case of the kind. I have published a case in which the patient came into my study with such a pedunculated little "currant" growth of one vocal cord, so simple looking that on the spot I lifted it off with Mackenzie's forceps, but when the report was that it was epithelioma, I did laryngofissure. In another case the patient came to the out-patient room with a pedunculated growth, which I regarded as malignant. I took it off and it proved so, and I did laryngofissure, but what we then removed proved to have no cancerous elements in it at all. This shows how superficial some of these early cases may be. But most of the cases I have had have been those in which the cord was simply infiltrated, just as it might be by a syphilitic deposit, and preliminary removal of a portion for microscopical examination would be impossible. You would have to take out a piece right through the middle in order to get a satisfactory microscopical examination.

(*February* 2, 1917.)

Extrinsic Cancer of the Larynx Two and a Half Years after Operation through the Side of the Neck.

By WILFRED TROTTER, F.R.C.S., and Sir STCLAIR THOMSON, M.D.

G. H., AGED 58, presented himself at King's College Hospital on February 24, 1914, with a reddish, slightly cauliflower growth of the left aryepiglottic fold, well limited and only extending a little way down towards the pyriform fossa. The Wassermann reaction was negative. Under cocaine a good portion of the growth was removed by the indirect method and reported to be a squamous-celled carcinoma. One gland was felt under the sternomastoid, just behind the left angle of the jaw. The case was transferred to Mr. Trotter, at University College Hospital.

First operation, March 31, 1914: Glands removed from the left side of the neck and found to be reaching from the base of the skull to below the clavicle. The sternomastoid was removed with the glands. The thoracic duct was cut and ligatured. This was followed by leakage of chyle into the wound, which was a long time in healing.

Second operation, June 9, 1914: A somewhat low tracheotomy was done. The larynx was approached through the old wound in the neck. The left ala of the thyroid cartilage was removed. Growth was found to be limited to the left aryepiglottic fold and about the size of a threepenny-piece. This was removed with the clear area of a third of an inch all round. The pharynx was sutured with catgut and a drainage tube inserted. The tracheotomy tube was left in for two days. The patient was discharged from hospital on July 3.

Although subject for many years to chronic bronchitis, and a heavy smoker, the patient remains well, with a good rough voice. In spite of the removal of the left arytænoid and left thyroid cartilage, it is remarkable that there is no glottic stenosis. There is a good fixed cicatricial band on the left side, which acts as a vocal cord.

DISCUSSION.

Mr. W. G. HOWARTH: I have operated upon one or two of these cases by Mr. Trotter's method, as he described it in his College of Surgeons lectures. In some cases the growth has been too high or too low for my ability. I would ask Mr. Trotter how he deals with the cases in which the growths are in the pharyngeal wall, up to the angle of the jaw; whether he does a snipping of the jaw and a turning up of the ramus, or whether he has some other method of getting at them? How does he reach the growth when it extends downwards behind the pyriform fossa and deeper down on the edge of the œsophagus?

Dr. WATSON-WILLIAMS: Is Mr. Trotter in the habit of removing the sternomastoid with the glands? And, in removing the ala, was the incision carried sufficiently high to divide the superior laryngeal nerve going beneath the ala on that side? If one can preserve that nerve, it is very helpful, because one of the greatest dangers in connexion with all these laryngeal operations is the loss of cough reflex. That is one of the reasons we remove our tracheotomy tube after laryngofissure, and why Sir StClair Thomson's patients did well when sitting up, because they had the best chance of responding to the calls of the superior laryngeal nerve. I show a rough drawing of a case in which there was a malignant growth which appeared to be in the back of the left arytænoid. To approach it from the front by laryngofissure would have made it difficult to deal with the posterior aspect of the arytænoid, especially as the growth extended downwards to the back of the cricoid, so I approached it by opening the pharynx laterally. I got sufficient space by exposing the inferior constrictor and making an incision from below the level of the upper border of the thyroid ala to nearly the lower border, and dragging the thyroid ala forcibly forwards, so as to get some rotation of the larynx. As intratracheal anæsthesia was used no tracheotomy tube was needed. Blood was prevented from getting into the trachea or larynx from the occlusion by the tracheal anæsthetic tube. In this way the left arytænoid was removed *in toto*, and the back of the cricoid cleared. The ala of the thyroid cartilage was intact, and hence there was no chance of subsequent falling in laterally, and, more important, the limited incision left the superior and external laryngeal nerves intact.

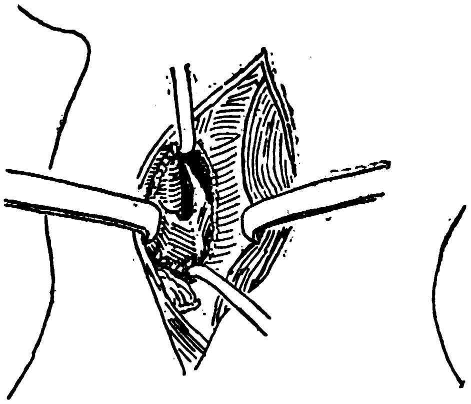

Diagram showing exposure of lateral and posterior aspects of larynx on the right side of neck, obtained by dividing the inferior constrictor along the posterior border of the thyroid ala, which is then forcibly drawn forwards. The dotted area on the left posterior cricoid wall shows the region occupied by the malignant growth. Above this the intratracheal anæsthesia tube is seen, and to the right of it the right arytæno-epiglottidean fold.

Sir STCLAIR THOMSON: I suppose it was inevitable, but I notice that there was a lapse of nearly four months between the diagnosis of the nature of the case and the removal of the disease. Mr. Trotter removed the glands, leaving the other operation till later. I suppose it was due to the leakage of chyle: otherwise, I take it, he would push from one procedure to the other as soon as possible. It was a great surprise to me that only one gland was felt under the sternomastoid, yet at the operation it was found that the glands reached from the base of the skull to the clavicle. Mr. Trotter said other cases promised well: I remember one which promised best of all, and I forget why, but the patient suddenly died. Is the shock more marked in these cases after this extreme dissection? And is it a warning which should put us on our guard? The whole of one half of the thyroid cartilage was removed on one side, and the left ala was removed. There is no stenosis. In some of my laryngofissures, where I had to take out the whole of one vocal cord, and perhaps three-fifths of the other, there was some stenosis. Formerly the patient could bicycle, and run upstairs, but after the operation he could not.

Mr. WILFRED TROTTER (in reply): In reference to the situation of the growth in relation to the incision when it is approached by this trans-thyroid operation, I may first remind you that normally we remove the ala of the thyroid, and then usually the great cornu of the hyoid as well. If that does not give enough room upwards, I divide the jaw also, though where this is necessary it is very improbable that the case would be cured by operation. When these growths get beyond a certain size, although it is technically possible to remove them and the result looks encouraging, they almost always recur. When a primary growth demands some procedure which is unusually heroic the prospect of cure is not generally good enough to recompense the patient for the discomforts of the operation and convalescence. Hence it is unusual for me to divide the jaw after removing the thyroid ala. There is no difficulty in obtaining increased access downwards. Free division of the infrahyoid and sternomastoid muscles with removal of the lateral lobe of the thyroid gland give access to the œsophagus as far down as the clavicle. With regard to extensive operations, the subject of removal of glands is on an entirely different footing. I am not at all alarmed by extensive gland infection, provided the glands remain isolated, and are not fixed to surrounding structures. Under such circumstances, we can almost guarantee a cure if we do an operation which is sufficiently drastic. The cases must be divided into two groups: The first group includes those cases in which the glands are not palpable; in this the ordinary operation is done without removal of the sternomastoid. The second group includes those cases in which the glands are palpable, and here we divide the sternomastoid and jugular vein close to the clavicle and remove the glands, fat, connective tissue, muscle and vein in one mass up to the skull. This case had one of the most extensive glandular involvements I have ever seen, but owing to the fat muscular neck it was practically impossible to detect the condition. We had even to divide the thoracic duct, in order properly to clear the lower end of the posterior triangle, and yet there is complete freedom from any evidence of glandular recurrence. As to dividing the superior laryngeal nerve, this is not usually important since we are usually about to remove the area to which the nerve is distributed. In a purely exploratory operation the nerve of course should be preserved until we know whether a radical excision of the growth is possible. With regard to rotating the larynx, I have done that several times in exploratory operations on the epilaryngeal region, but it gives a less satisfactory access to the region in question and I see no objection to removing the ala of the thyroid; it does not cause subsequent stenosis and it gives admirable access to the upper larynx. With reference to the dangers of the operation in comparison with those of laryngofissure, the difference is a very obvious fact of experience, and it is due to the fact that these epilaryngeal tumours are, technically, growths of the pharynx, not of the larynx. As long as we keep inside the larynx, we have nothing to do with such organisms as we heard of earlier in the meeting, the fusiform bacillus and the spirochætes of the mouth; but when the pharynx is encroached upon by the operation, they have always to be reckoned with and to be dreaded. Any wound involving the pharynx or œsophagus is liable to a sloughing infection which very small defects of technique may render extremely dangerous or wholly uncontrollable. The merest scratch of the epithelium of the pharynx leads, as is well known, to the formation of a slough. In laryngofissure, there being no implication of the pharynx, it is not necessary to take any *special* precautions against sepsis, whereas in operations done on the pharynx almost the whole procedure is concerned with protection against the effects of the peculiarly virulent local types of infection. The special dangers of the pharyngeal infections are well seen in an operation apparently so simple as the removal of a pharyngeal pouch. If the closure of the gap left by the excision of the sac is not such as to render leakage impossible, there is the gravest risk of very serious and even fatal sloughing cellulitis and mediastinitis. Such forms of cellulitis spread rapidly, and often without much external evidence, and even if the patient survive the immediate danger, are particularly apt to cause secondary hæmorrhage. The length of the period between diagnosis and operation on the primary growth was due to delay in getting a bed in the hospital for the patient, but chiefly to the fact that resection of the thoracic duct at the time of the gland operation led (through escape of chyle) to interference with the healing of the wound. Until the wound made for the neck dissection, which was very extensive, had healed soundly, the operation on the pharynx could not be undertaken.

(*February* 2, 1917.)

Epithelioma of Left Maxillary Antrum and Left Ethmoid, Four Years after a Moure's Operation (Lateral Rhinotomy).

By Sir STCLAIR THOMSON, M.D.

THIS case is published in full in the *Lancet* for May 13, 1916, and was shown before the Clinical Section of the Royal Society of Medicine, February 14, 1913, and the Clinical Congress of American Surgeons, July, 1914. The interesting points will, therefore, be referred to briefly.

The subjective symptoms were slight and recent; grumbling pain in the cheek for two months. In the Moure operation two facial incisions were made, instead of the single one now recommended. Alarming symptoms, suspicion of serous meningitis, followed the operation, but subsided in a few days. The growth was a squamous-cell carcinoma, and although it had broken through the canine fossa and the antro-nasal wall, there is no recurrence after four years. The absence of disfigurement and the comfort of the patient, especially when compared with the operations formerly employed in general surgery, are remarkable. There is no trouble in the way of atrophic rhinitis, in spite of turbinal removal, and there is no epiphora.

(*February* 2, 1917.)

Round-celled Sarcoma of Right Maxillary Antrum, Ethmoid and Nasal Cavity, Two Months after a Moure's Operation (Lateral Rhinotomy).

By Sir STCLAIR THOMSON, M.D.

E. C., AGED 62. This case is also interesting on account of the slight, recent and even remote symptoms the patient complained of. He consulted Mr. Hugh Smith, of Farningham, simply because of right occipital headache and insomnia, and it was only incidentally that he referred to nasal obstruction on the same side. This was found to be caused by a fleshy, vascular growth on the roof and outer side of the right choana and was evidently an off-shoot of malignant disease of the right maxillary and ethmoidal sinuses. There were decidedly hard glands in the right neck.

On December 13, 1916, a Moure's operation was performed through a single facial incision. This gave easy and complete access to the antrum, ethmoid, and roof of the nose, which were all crowded with typical malignant growth. The os planum had been destroyed by it, and the cribriform plate had gone, so that the dura mater was exposed and its pulsations were easily watched. Removal may be incomplete, but the case is shown to illustrate the great advantage of a single incision, the relief of symptoms, and the absence of disfigurement.

Hæmorrhage was easily controlled during operation. The exposure and handling of the dura mater caused no after symptoms. A fortnight after operation the patient complained of blindness in the right eye and he was found to have a retrobulbar neuritis with papillary œdema. The glands in the neck have had three applications of X-rays, and can hardly be felt.

N.B.—The patient has not been seen since January 4, and conditions may have altered.

(*February* 2, 1917.)

Carcinoma of the Right Maxillary and Ethmoidal Sinuses, Seven Months after Operation by an Oblique Facial Route.

By CECIL GRAHAM, F.R.C.S.

C. S., AGED 50, was seen by Dr. Hill in May, 1916, on account of swelling of the right cheek, proptosis, and nasal obstruction, with blood-stained discharge. The right nasal fossa was filled by growth, which obscured the view beyond the vestibule. Dr. Spilsbury reported upon a piece of the growth sent for microscopical examination that it was "squamous carcinoma of a very malignant type."

After the removal of several carious teeth, operation was performed on May 24, 1916, Dr. Chaldecott giving ether by the intratracheal method. An osteoplastic flap, resembling that which Dr. Watson-Williams describes, was turned over the cheek on the left side, the septum was removed completely behind the vestibular portion, and a complete view, with easy access, was obtained, by which it was possible to remove the lateral mass of the ethmoid, the inner wall of the maxillary sinus, the floor of the orbit, to clear out the cavity of the maxillary sinus, to remove some growths adherent to the orbital periosteum interiorly, and to explore the sphenoidal sinus. The latter was not involved. The patient sat up in twenty hours, was out of bed in forty hours, and left hospital in twelve days after the operation, after an uneventful recovery. The method of anæsthesia was a great comfort during the operation, particularly with regard to hæmorrhage, although this was not great. The photographs shown were taken twelve days after operation.

A dissected specimen is shown in order to illustrate the easy access obtained in the foregoing case by the oblique route.

(*February* 2, 1917.)

Carcinoma of the Right Maxillary Antrum; lateral Rhinotomy (Moure's Operation) performed.

By Irwin Moore, M.B.

Patient, a widow, aged 62, attended hospital in September, 1916, complaining of gradual swelling of the upper part of the right cheek during the previous seven weeks. No nasal discharge was present nor any other symptom. On the upper lip was seen a scar resulting from an old sore occurring forty years ago. Patient was not seen again for a month. At this time she complained of pain in the right temporal region, ear, upper jaw, and under the eye. Transillumination showed both antra opaque. On puncturing and washing out the right antrum, the fluid passed freely and the washings contained a considerable quantity of pus. Slight bleeding followed the puncture.

On November 8 the antrum was explored through the canine fossa, and found to be partly occupied by a polypoid growth, infiltrating the anterior bony wall and extending upwards and outwards under the malar bone.

Portions of growth were removed for examination.

On November 23 a lateral rhinotomy (Moure's operation) was performed by means of the double incision. The anterior bony wall of the antrum was found to be involved and extensively necrosed; the soft parts of the cheek were not infiltrated. The antro-nasal wall, floor of antrum and orbit were apparently intact. The growth, together with the necrosed anterior wall, was removed by forceps and curettes; five days later the face wound had healed and the sutures were removed, only slight œdema of the lower eyelid being present. No rise of temperature occurred above 100·4° F. She returned home twelve days later.

Patient is now shown, three months after operation. There is practically no nasal discharge, and she only complains of slight pain in the right upper jaw.

Microscopical Report.—This growth has the histological structure of a carcinoma. The cancer cells are arranged in the form of solid masses and columns, freely infiltrating the fibrous stroma. There is no evidence of invasion of the bone by the growth. Whether the carcinomatous cells take origin from the glandular element or the dermic element of the mucous membrane is not quite demonstrable, but many of the alveoli are somewhat cylindrical in form, suggesting the glandular element.

A similar case to this, in which the growth proved to be a small round-celled sarcoma, was shown by the exhibitor at the meeting of the Laryngological Section[1] on November 3, 1916.

This case is of interest in that:—

(1) Primary carcinoma of the maxillary antrum compared with sarcoma is rare.

(2) It further confirms (as in cases previously shown at the meetings of this Section) the great advantage of Moure's operation, with its free access and thorough removal of the disease, over complete resection of the upper jaw with its accompanying deformity and discomfort.

Microscopical sections of the growth are shown.

DISCUSSION.

Dr. WATSON-WILLIAMS: I pass round a specimen to show the degree of approach one can get to the inferior part of the nose by making an osteoplastic flap on the same side as the growth. This was a case of round-celled sarcoma, which was very hæmorrhagic. In 1907 I performed the first operation on this patient.[2] A growth the size of a bantam's egg appeared to have originated in the upper and posterior aspects of the ethmoid labyrinth: it involved the antrum, and extended to the septum. It seemed to have recurred in 1910, but a piece removed *per nasum* was pronounced by the pathologist not to be malignant. But it did recur in 1916—nine years after the operation. The lesson from that is, that a vascular sarcoma is not necessarily of a high degree of malignancy. The entrance gained by this osteoplastic flap, sufficient to enable one to get the growth entirely away, to clear the ethmoid labyrinth, and remove the central and sphenoidal sinus wall, affords all the approach that could be wished. The osteoplastic flap was replaced carefully, and it healed, leaving no scar nor depression whatever. One advantage of the removal of the septum nasi is that it enables us to get an oblique approach to the left side through the right nasal passage, should that be desired.

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[1] *Proceedings*, p. 29.

[2] For description and illustration of my operation see *Rhinology*, p. 113.

Mr. E. D. D. DAVIS: I saw Sir StClair Thomson operate on the old man shown to-day, who was blind in one eye. He performed Moure's operation for sarcoma of the antrum, and I was surprised at the easy access he obtained. There was only one incision, down the side of the nose, and it could be continued into the lip or upwards. It was not necessary to make a second incision under the eye. I have myself had only a small number of cases; I have employed Moure's operation, and by continuing the incision in a straight line, I have obtained good access. I have found intratracheal ether a great comfort, and it adds to the ease of the operation. In this patient the dura mater was exposed, but he seems to have recovered in a very satisfactory way, and the operation was excellent.

Mr. FRANK ROSE: There is a remark in Dr. Irwin Moore's record of his case: "This case is of interest in that primary carcinoma of the maxillary antrum compared with sarcoma is very rare." My experience has been precisely the contrary. In cases of malignant disease of the maxillary antrum, the growth has proved, under the microscope, to be carcinoma. I can only recall two cases in which it was sarcoma, and even in those it was not certain that it did not begin in the ethmoid. On what grounds does Dr. Irwin Moore make the statement?

Dr. DAN MCKENZIE: I agree with Mr. Rose that malignant disease of the antrum is generally epithelioma, while the ethmoid is the seat of sarcoma Allusion has been made to the fact that those sarcomata are "'*query*' sarcomata," as their malignancy is so slight and they seldom recur after removal. The occurrence of serous meningitis in Sir StClair Thomson's case is interesting. A mild form of serous meningitis is, I believe, not uncommon after nasal operations. In cases of that kind of difficulty a hint might be borrowed from the otologists and lumbar puncture done, because of the very prompt relief it affords. It may be necessary to repeat it after two or three days' interval.

Dr. KELSON: When first I saw Dr. Irwin Moore's case, which is a very interesting one, there was a dullness on both sides on transillumination, and pus was present in both antra. As there was a history of syphilis in the case, I suspected a tertiary syphilitic lesion, but Dr. Moore was anxious to do a Moure's operation, and then it was found to be malignant.

Dr. PEGLER: In regard to what Dr. McKenzie has just said as to nasal sarcoma, I fear I am in total disagreement with him. Though far less malignant than carcinomata, these growths range themselves quite easily under the groups of small and large round-cell sarcomata, met with elsewhere.

Dr. DONELAN: As regards the ætiology, some of these cases may be due to disease of the ethmoid. Several years ago I removed in one case a large number of mucous polypi and curetted the right ethmoidal region. The patient remained well for about ten years. Four years ago he wrote that his trouble had recurred, but he did not come up until early last year. He had then a large mass of apparently mucous polypi, with some hard red polypi amongst them, growing from the ethmoid and filling the antrum. I removed the whole mass by Moure's operation. The report stated carcinoma. Recurrence, however, took place in the orbit, and the patient died nine months later. This case would appear to confirm Mr. Rose's view that malignant growths of this region are generally carcinomatous.

Dr. W. HILL: Mr. Graham is to be congratulated on his technique, though I do not say it will supersede Moure's operation in every instance. One gets by it a very extensive and open lateral view, including the ethmoidal region, the cribriform plate, the sphenoidal sinus wall, and the whole antral cavity. All must be impressed by the æsthetic result, as the incision scars can scarcely be seen, and thus compare favourably with the evident scars in Moure's operation.

Dr. IRWIN MOORE (in reply): I think I must be wrong in stating that primary carcinoma in this situation is rare. I have just had a conversation with Mr. Trotter, and he considers that carcinoma is more common than sarcoma. I thank Dr. Kelson for transferring the case to me. It is now three months since the operation, and I find that during the last month there has been a recurrence. With regard to the question of the single incision it was impossible in this case to reach the growth and clear it away without a double incision, because the antral wall was so much infiltrated by the disease. As in the case of a sarcoma of the antrum, upon which I recently operated, and which I showed at the last meeting, the growth could not have been satisfactorily reached and removed by the one incision, owing to the muscles of the cheek being extensively infiltrated.

Sir STCLAIR THOMSON (in reply): In my first case, although I did not think I was near the cribriform plate, the patient got symptoms which were very alarming: she was apathetic the next day, and had a temperature of 104° F., but she recovered. In the second case Mr. Davis will confirm my statement that the cribriform plate was gone, the dura mater was freely exposed, and yet the patient was not the worse. Neither of the cases had suppuration: there was no sinusitis going on. The first case would have been in a different condition had I accidentally wounded the cribriform plate or the olfactory region in the presence of streptococci, for instance. In the second case the disease spread through the sphenoidal fossa, as shown by the complete ophthalmoplegia. I think Mr. Graham's method is ideal for approaching the ethmoidal cells, but otherwise I do not agree that it is an improvement, because there could not be a freer access to the antrum or to the fronto-ethmoidal cells than is secured by a Moure's operation: it is distinctly *en fosse*, instead of being oblique.

(*February* 2, 1917.)

Epithelioma of the Nasopharynx; Operation; Diathermy.

By NORMAN PATTERSON, F.R.C.S.

PATIENT, a male, aged 36, tailor. History of operation on nose five years ago, when a "piece of bone was removed." He was admitted to the London Hospital on November 15, 1916. He complained of obstruction on both sides of nose, thick discharge, and loss of smell for six months. There has been headache in the right forehead and temple for two months. He is losing flesh rapidly. An examination showed a large, irregular, cauliflower-like mass, ulcerating in places, occupying the whole nasopharynx. There were no enlarged glands in the neck. There is slight deafness on the right side; no history of aural discharge. A portion of the tumour was removed and examined by Dr. Turnbull, who reported "solid trabecular squamous-celled carcinoma."

Operation, November 17, 1916: The soft palate was split. The incision was made from the right side of the base of the uvula. The view obtained was insufficient. The incision was carried forward through the mucous membrane of the hard palate to within 1 in. of the incisors; the posterior ¾ in. of the hard palate was removed with a chisel, also a portion of the posterior edge of the septum nasi. The attachment of the tumour defined with the finger was found to be more or less circular, occupying the roof and the right wall of the nasopharynx, and extending up to the base of the septum. The tumour was plucked away with the forceps close up to the attachment; hæmorrhage was stopped by pressure; the base of the growth was clearly defined. Together with surrounding tissues, this was thoroughly destroyed by diathermy. The palate was afterwards united.

The sense of smell returned three days after operation; recovery was uneventful. The palate is firmly united, and beyond some crusts there is nothing to note in the nasopharynx.

(*February* 2, 1917.)

Specimen of Antro-choanal Polypus.

By W. JOBSON HORNE, M.D.

THE patient, a woman aged 31, was sent to the hospital by her doctor on account of obstinate nasal catarrh of long duration. Anterior rhinoscopy disclosed material hypertrophy of the middle turbinal bodies, but no evidence of polypus or suppurative disease. Posterior rhinoscopy showed the post-nasal space to be almost entirely occupied by a polypus which became directly obvious upon partly raising the soft palate. The polypus was removed through the mouth. The anterior ends of the middle turbinal bodies were reduced. After the removal of the polypus the left choana was found to be wider than the right; the polypus originated from the left antrum. Upon transillumination the left antrum was as translucent as, or even more so than, the right. In the circumstances, it was considered to be better to await results than to open the antrum.

It is hoped that the case will invite a further discussion upon some of the points raised at the last meeting, when a similar case was shown.

The polypus, which is exhibited, is pear-shaped and was attached by a pedicle as long and as firm as the polypus itself. The polypus upon section was solid with the exception of a small central cavity. It is fibrous in consistency.

(*February* 2, 1917.)

A Choanal Polypus originating in the Sphenoidal Sinus of a Child, aged 6.

By IRWIN MOORE, M.B.

THE patient, a girl, attended the London Throat Hospital in December, 1915, complaining of inability to breathe through the left nostril for three months. The exhibitor first saw her in May, 1916, when a large, flattened polypus completely filled the left nasal fossa. No nasal discharge was present.

On palpation of the nasopharynx, an irregular, hard swelling was felt protruding through the left choana. Under general anæsthesia the nasal portion was removed by forceps through the anterior naris, leaving a pedicle attached posteriorly, which was traced to its origin in the left sphenoidal sinus. The posterior portion was so tightly wedged in the left choana that forceps, introduced through the mouth, could obtain no hold. It was removed with difficulty through the anterior naris. On examination, the growth was found to consist of two polypi, originating by separate pedicles from one common stalk,

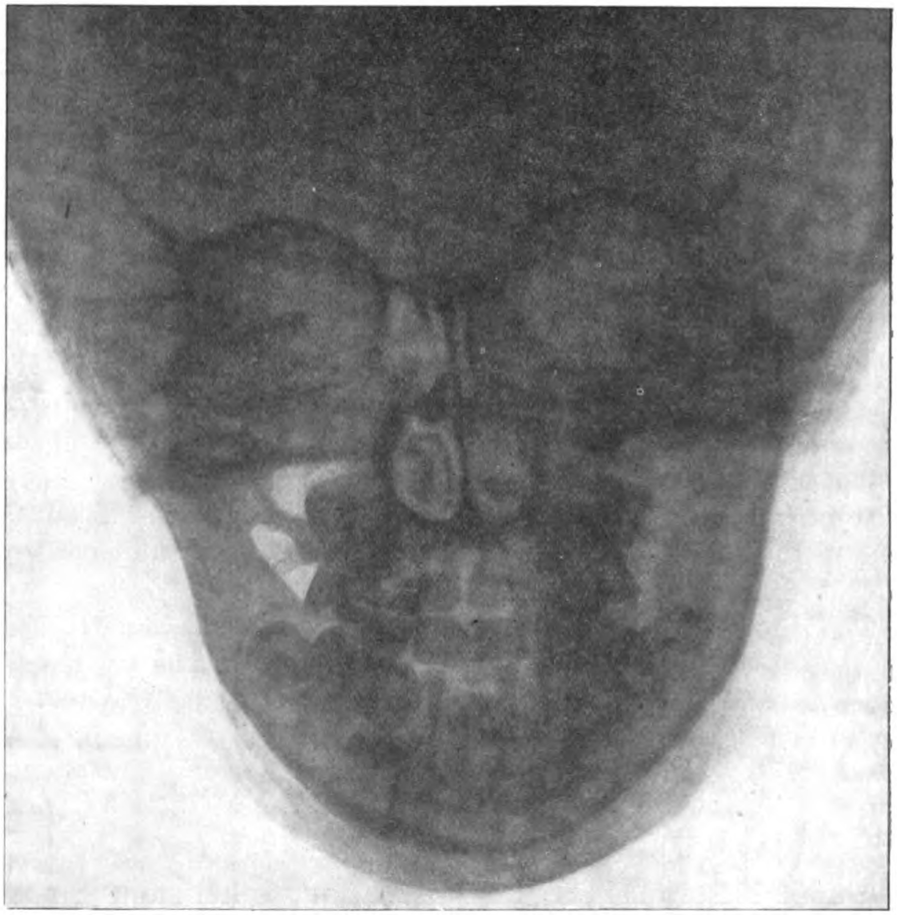

FIG. 1.

Choanal polypus originating in the left sphenoidal sinus of a girl, aged 6. Shows left ethmoid region opaque.

the anterior portion being soft and gelatinous, the posterior being bi-lobed and of a fibrous consistence.

On exploring the posterior naris, the ethmoid region was found to be healthy and the antral wall intact. The posterior edge of the vomer was partly destroyed by the pressure of the growth. A large opening into the sphenoidal sinus admitted forceps, probes or gouge with freedom. The sinus was about the size of a hazel nut. The right nasal fossa was normal.

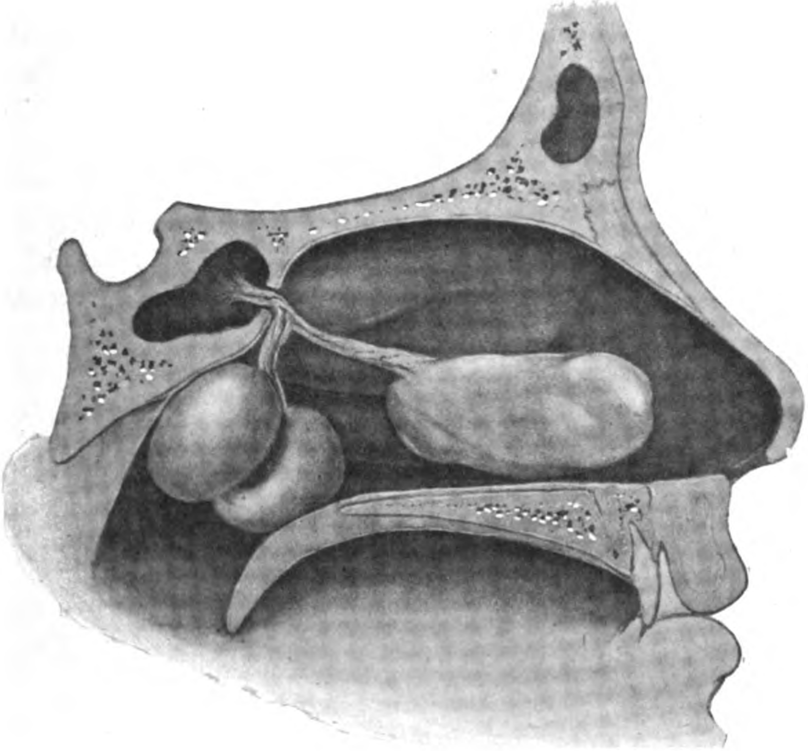

FIG. 2.

Choanal polypus originating in the left sphenoidal sinus of a girl aged 6. Shows a sagittal section through the left naris with the growth placed in position.

It was apparent that the polypus had originated in the left sphenoidal sinus, and the main pedicle, which was flattened on one surface, had probably been adherent to the spheno-ethmoidal recess. The case was seen at King's College Hospital two weeks later by Sir StClair Thomson, who confirmed this opinion.

Microscopical Report.—The polypus is composed of highly vascular fibrous tissue which is œdematous. It is fairly rich in connective tissue cells and in the superficial areas there is some leucocyte infiltration, and also a good deal of mucoid degeneration. Mucous glands are very few in number. It is a soft fibroma.

This case is of interest in that:—

(1) Though the maxillary antrum is the common seat of origin of choanal polypi, yet it is rare to find them in children under 10 years of age, only a few cases being reported.

(2) It is extremely rare to find a choanal polypus originating in the sphenoidal sinus, and the exhibitor has been able to find only two cases reported, and these were in adults. He is unable to find the record of any case occurring in childhood.

(3) There was no suppuration in the sinus.

A radiogram (fig. 1, p. 66) is exhibited showing the left ethmoidal region to be more opaque than the right. A life-size drawing is shown of the polypus after removal (fig. 2, p. 67), also a sagittal section through the left nasal fossa of a child, with the growth reconstructed and showing its origin and position.

Microscopical sections are also shown.

DISCUSSION.

Dr. WATSON-WILLIAMS: Sphenoidal polypus is sufficiently rare to justify my showing, stereoscopically, this polypus growing from the sphenoidal sinus. I obtained the specimen from Vienna. Dr. Irwin Moore's case is one of very exceptional interest, proving that even in a young child polypus may occur in the sphenoidal sinuses. I am more and more convinced that sinus infection is more often present in young children than is usually suspected. I believe recurrences after adenoid operations are sometimes of this nature. A child was brought to me eighteen months after a tonsil and adenoid operation by a very competent operator, and when I explored the antral cavities of the child, which was aged 5, with my antral suction syringe, there was antral streptococcal infection on the left side. I think it accounted for the re-infection of the lymphoid chain in the nasopharynx.

Dr. PEGLER: I do not quite follow Dr. Watson-Williams in his view of a possible cause of recrudescence of lymphoid tissue in the nasopharynx (adenoids), and I imagine there is a much more frequent cause of recrudescence of a remnant of adenoid tissue than infection from sinus suppuration. With regard to Dr. Jobson Horne's case, very soon after Sir StClair Thomson showed his specimen at the last meeting I had a similar one, in a young woman aged 21; it was a second recurrence. In the last instance it appeared to be a polypus attached to the roof of the choana, but on examining it again I could make sure it was a polypus protruding from the ostium of the antrum. I removed it through the nose, without difficulty, by seizing it securely with Luc's forceps, and drawing upon it gradually. This was three months ago, and there is no sign of recurrence. There was no suppuration.

Dr. IRWIN MOORE: With reference to Dr. Jobson Horne's case, and the question whether the antrum should be opened in these cases, I think that it should be made an invariable rule to open the maxillary antrum through the canine fossa in all cases of choanal polypi when their origin has been definitely located in the antrum, in order that one may be certain of separating and thoroughly removing the pedicle from its attachment to the antral wall. This is advisable on account of their frequent recurrence after simple removal by snare or forceps. In connexion with these cases I have received letters from both Dr. W. S. Syme and Dr. Brown Kelly, who are unfortunately prevented by military duties from attending this meeting, the last-mentioned having, perhaps, seen more cases of antral polypi than anyone, and they both hold these views as to operative procedure. Dr. Syme sends me the following notes of an instructive case having an important bearing on this question. He says in January, 1908, he removed a solitary choanal polypus from a boy aged 9. The polypus quickly returned, and in May of the same year he removed another large growth. In January, 1911, the patient was seen again, and another large choanal polypus was present. This time Dr. Syme opened the maxillary antrum and traced the polypus to its origin in the antral cavity. There was also degeneration of other parts of the antral lining membrane. Since this operation there has been no further trouble with that antrum. This is only one of many similar cases which have been reported and confirms the necessity of radical extirpation of these growths.

Mr. E. D. D. Davis: I have investigated eight of these cases, two of them in children, and I have never found antral disease in any of them, though examined by transillumination and with the exploring syringe. The polypi have been removed, they have returned, and been removed again, and perhaps a third time, but I have not been able to establish the fact that there has been any disease of the antrum. The polypi grew from the middle meatus, they were post-nasal choanal polypi, and had a long pedicle. I do not agree that if you find the lotion aspirated from the antrum contains micro-organisms and no pus, it means that the antrum is diseased, because such organisms may normally exist in the nose, and contamination must frequently occur.

Dr. WATSON-WILLIAMS: I did not say that the fact of organisms being in the fluid washed from the antrum proves that it is infected, but that the absence of purulent discharge on washing out the antrum does not prove that it is not infected.

Mr. HERBERT TILLEY: With regard to the origin of these single choanal polypi (which often tend to become cystic and to burst when taken hold of), they generally have their origin within the antrum and near to the accessory ostium. If you open the antrum through the canine fossa and take hold of the polypus from its choanal aspect, you will see that the pull is also being exerted on the mucous membrane of the antrum. Frequently they are unassociated with any purulent secretion. They seem to me to be a localized chronic inflammatory condition of the antral mucous membrane. In many cases a permanent cure may be brought about after one removal by forceps or snare, but recurrences can only be prevented by opening the antrum and removing the implanted pedicle of the tumour.

Dr. DONELAN: Seven years ago I operated upon a young man for a long pedunculated growth springing from the right accessory ostium, and I showed the specimen here. There was no suppuration in that case, and several growths of the kind have been recently shown before the Section in which it was stated they were not associated with suppuration. A fortnight ago I operated on the opposite antrum of the same patient, but the right antrum, from which the growth was originally removed, had remained quite healthy. That supports Mr. Tilley's statement that we should not always be so anxious to enter through the canine fossa. For my part I think it quite unnecessary and I have seen one or two cases in which after that procedure the levator anguli oris has been involved in the cicatrix of the canine opening, establishing a chronic smile on that side.

Dr. JOBSON HORNE (in reply): With regard to opening the antrum, we must remember that these cases of so-called choanal polypus are not in the same category as the more common cases of nasal polypus, and the pathogenesis is entirely distinct. Some of them appear to be congenital, although of slow growth, therefore they cannot be discussed on the same footing as suppurative disease of the antrum. I did not open the antrum in this case, because I felt I should like to do to my patient as I should like to be done by; after the polypus had been removed, I should like my antrum left untouched. If there should be a recurrence, then we could consider the advisability of investigating the antrum, and even if that were done I do not think a further recurrence would be prevented.

Dr. IRWIN MOORE (in reply): I am expressing the views held not only by Dr. Brown Kelly, who has records of forty cases of choanal polypi arising in the maxillary antrum, but also by Dr. Syme, whose article on "Choanal Polypi" in a recent issue of the *Journal of Laryngology*[1] deals with this matter; and also by Kubo, whose contribution on "Solitary Choanal Polypi" was published in 1913. All agree that these growths should be dealt with by radical operation. Transillumination for diagnostic purposes is of no value in these cases, for the antrum on the affected side is as translucent or even more so than on the normal side, whereas to X-rays the affected antrum appears opaque. This contrast of transillumination and X-rays has been investigated by Mr. Hett and Dr. Finzi. The combination of these two tests is of great diagnostic value in the localization of antral polypi.

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[1] *Journ. Laryng., Rhin. and Otol.*, 1916, xxxi, p. 515.

(*February* 2, 1917.)

Laryngeal Mirror used by Manuel Garcia, the Discoverer of Auto-laryngoscopy ; also the Apparatus used by him to demonstrate the Physiology of the Vocal Cords.

By IRWIN MOORE, M.B.

THESE interesting relics of the early days of laryngology are lent by his son and pupil, Professor Gustave Garcia, to whom they were given (by his father) many years ago; they have not been shown before in public. The exhibitor feels that they may prove of some interest to members of this Section. In the centre of the frame is the original pencil sketch of Manuel Garcia, at the age of 70, by his sister, Mme. Pauline Viardot, the famous operatic singer.

A short history of this remarkable man would appear not to be out of place here.

Manuel Garcia, singer, teacher of singing, and composer, was born at Madrid on March 17, 1805. He was the son of Manuel del Populo Garcia, the famous tenor, composer, actor, and conductor, who was born at Seville on January 22, 1775, and died in Paris on June 21, 1832. His mother was Jacquina Briones, the leading Spanish actress of her time.

In 1848 Manuel Garcia came to London and practised as a teacher of singing. In 1825 he commenced his scientific inquiry into the conformation of the vocal organs, which resulted in the application of the laryngoscope and his presentation to the French Institute of a "Mémoire sur la Voix humaine," which was "crowned" by the Academy. In 1847 he published his "Traité complet de l'Art du Chant." In 1855 he addressed a paper entitled "Physiological Observations on the Human Voice" to the Royal Society. These brilliant researches on the anatomy and physiology of the larynx were published in the *Proceedings* of the Society.[1]

To Manuel Garcia belongs the credit of having been the first to employ a laryngeal mirror for physiological purposes; the first who succeeded in obtaining a view of his own larynx by means of a dentist's mirror. By this means he was able accurately to describe the parts he saw in the mirror and their respective motions. How he at length obtained the desired object he describes himself. Standing with his back to the sun, he held a looking glass in his left hand before his face, the sun's rays were thus reflected by the glass into his open mouth. Then he introduced a dentist's mirror—previously warmed—into the back of his mouth and by placing it at a proper angle, he was able to see the reflection of his larynx in the looking-glass. Autolaryngoscopy was discovered; it was an indisputable fact. His feelings —when he saw for the first time how the vocal cords acted whilst he was emitting sounds—were described to his son Gustave Garcia as follows: "I was most fortunate, for I succeeded almost at once in seeing with my own eyes what I had conceived so long; it gave me such a turn that I felt on the point of collapsing."

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[1] "Observations on the Human Voice," *Philosoph. Mag. and Journ. of Sci.*, x, and *Gaz. Hebdom. de Med. et de Chir.*, November 16, 1855.

It will be fresh in the memory of most laryngologists present to-day that Manuel Garcia celebrated his centenary on March 17, 1905, when he was entertained at a banquet by the Laryngological Society of London and presented with his portrait painted by Mr. Sargent His late Majesty, King Edward VII, conferred on him the decoration of Commander of the Royal Victorian Order, while the Royal Order of Alphonso XII was also conferred on this veteran. He reached the ripe age of 101, and died in London on July 1, 1906.

DISCUSSION.

Dr. DONELAN: I do not like to criticize a family relic of this kind, but it should not pass into the official record of our proceedings, that this is the mirror originally used by Garcia. This type of mirror was not designed by Morell Mackenzie until many years after Garcia had used a dental mirror for his experiments. Garcia always liked to use a Mackenzie mirror, and I have personally given him mirrors on behalf of Sir Morell Mackenzie on at least two occasions. The mirror shown may be one of them.

Dr. IRWIN MOORE (in reply): It was my intention to alter the title to "Laryngeal Mirror," &c.[1] There is no question that this is a mirror with which he used to demonstrate to his pupils the action of the vocal cords, and is not the one that he used when he first saw his own vocal cords. It will be observed that in the manuscript reference is made to the first mirror which he used as being a dentist's mirror.

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[1] The original title given to this note was "An Original Mirror used by Manuel Garcia," &c., &c.

(*February* 2, 1917.)

Hæmatoma (?) of the Posterior End of the Inferior Turbinate.

By F. A. Rose, F.R.C.S.

In August, 1916, the patient (a medical man) complained of a blood-stained discharge from the back of his nose for three days, following stuffiness of one nostril of considerable duration. A smooth, round swelling filled three-quarters of the right choana. It looked like a blood-clot, but all attempts to wash it away were futile, and finally it was snared. It will be seen that the swelling consists of delicate connective tissue infiltrated with blood. There have been no symptoms since removal.

Has anyone present met with a similar case?

DISCUSSION.

Dr. Pegler: I know of no previous record of a hæmatoma of the posterior end of an inferior turbinal. Mr. Somerville Hastings once exhibited sections of a discrete nasal angioma of the usual type, but the present is a pure hæmatoma.

Mr. Frank Rose (in reply): The patient was between 35 and 40 years of age. I have not seen or read of a similar case.

(*February* 2, 1917.)

Specimen from a Case of Fatal Hæmorrhage from Gunshot Wound involving the Superior Thyroid Artery.

By H. Lawson Whale, Captain R.A.M.C., F.R.C.S.

(Shown by Dr. Dundas Grant.)

Private G. H., admitted November 1, 1916. His temperature was 103·6° F., pulse 128, respiration 36, and the bases of both lungs were dull. A rifle bullet had traversed his larynx in the coronal plane, entering on the left side opposite the greater cornu of the hyoid, which was fractured at its junction with the body of this bone, and emerging at the level of the right aryepiglottic fold.

On November 3, a fit of coughing caused profuse intralaryngeal hæmorrhage, which was unaffected by digital pressure applied to the carotid artery; and in a few minutes, before further measures could be adopted, he died from asphyxiation.

Autopsy.—The lower lobes of both lungs were solid with pneumonia. The trachea and bronchi were full of frothy serum and short broken casts of blood-clot. The course of the bullet corresponded to the clinical appearances. In its transit, it had fractured the left greater cornu of the hyoid at its junction with the body, and, traversing the anterior part of the supraglottic space, had deeply grooved the base of the epiglottis. The right superior thyroid artery, at the highest point reached by the upward loop at its origin, had been cleanly severed by the bullet.

(*February* 2, 1917.)

Carcinoma of the Floor of the Mouth treated by Diathermy.

By F. A. Rose, F.R.C.S.

G. M., aged 56, was seen by Mr. Tilley, who diagnosed carcinoma of the floor of the mouth in July, 1915.

August, 1915: Diathermy was applied by Mr. Harmer.

November, 1915: A second application was made by the exhibitor.

At the present time there is no ulceration, and the patient is perfectly comfortable except for a feeling of tightness caused by the scar tissue.

A microscopic specimen is also shown.

DISCUSSION.

Mr. Herbert Tilley: The result in this case is excellent. There was a hard ulcer, now there is a soft scar. Such a case gives us hope that in these early stages of malignant disease one may get a good result by a simpler form of treatment than the usual operations which are necessary for dealing with cancer of the floor of the mouth.

Mr. Frank Rose (in reply): I think Mr. Tilley is somewhat optimistic in his remarks. The patient appears well at present, but how long he will remain so I do not know. It is fifteen months since the last operation was done.

(*February* 2, 1917.)

Case of Laryngeal Cyst.

By CYRIL HORSFORD, F.R.C.S.

PATIENT, a male, aged 46, came to the Throat Department of the Royal Hospital for Diseases of the Chest in August, 1915, with acute œdema of the left arytænoid and aryepiglottic fold. There was loss of voice and dyspnœa. The swelling was scarified. At his next visit, the following week, all œdema had completely disappeared and there was no evidence of disease which might explain the condition. The urine contained a slight trace of albumin. There were no tubercle bacilli in the sputum.

In August, 1916, the patient returned with a large cystic swelling involving the left ventricular band and left aryepiglottic fold and extending into the left pyriform fossa—an appearance exactly similar to the present condition. His dyspnœa was pronounced, and to relieve his distress the cyst was punctured with a cautery point. A large amount of blood-stained gelatinous fluid escaped. Until puncture was done it was impossible to punch out a portion of its wall, owing to its slippery surface and toughness. Although a large portion of its wall was removed, the cyst quickly refilled, and on two occasions has burst, with relief to the patient. There has been no material change during the past six months. Report of section cut by Dr. Bach: "Exact nature is obscure, but the material appears to be of an adenomatous nature, with a malignant tendency." A section is shown under the microscope. The urine is now free from albumin, and contains no casts. Wassermann reaction negative.

Suggestions as to treatment are invited.

DISCUSSION.

Mr. HERBERT TILLEY: Two years ago I had to deal with a case which presented the same appearance as in Mr. Horsford's case. My patient nearly suffocated on two occasions, and one night he saved his life by putting his finger down his throat and bursting the cyst. It recurred and became distended again, when I opened it, and cut out a considerable quantity of the wall with laryngeal forceps; the symptoms disappeared, and a week later there was nothing to be seen of the tumour. However, in six weeks' time it was filling again, and one night he again nearly choked. In the mid-line of his neck, in the thyro-hyoid region, he had a swelling, which increased in size and became septic. We drained it for some time, but the fistula would not heal, and Mr. Trotter therefore took the case over for me, and will describe to you what he found. I think in Mr. Horsford's case the laryngeal cyst is probably an extension from the thyro-hyoid region, especially as Mr. Horsford's notes say that some gelatinous fluid escaped when the cyst was opened by him.

Mr. WILFRED TROTTER: When I first saw the man to whom Mr. Tilley refers, he had a chronic sinus in the front of his neck, over the thyroid cartilage, and I found it led down to and passed behind the ala of the thyroid, in the region of the thyro-hyoid interval; hence I thought it was a thyro-glossal cyst. But instead of taking its way towards the middle line under the hyoid bone, it turned laterally and passed into the thyro-hyoid interval at the side, and went up, but chiefly downwards. We removed the ala of the thyroid until the cyst was traced to the level of the vocal cord. Internally to the cyst was the very thin mucous membrane of the larynx, and on the other side was the ala of the thyroid cartilage. I should not like to offer an opinion as to what the cyst was pathologically, but that was its anatomical distribution. It is clear that the swellings, which appeared first inside and then outside, communicated, and that the internal extension in the region of the upper opening had shrunk on account of inflammation. My advice would be to attack Mr. Horsford's case from the outside after removal of the ala of the thyroid.

Mr. CYRIL HORSFORD (in reply): I am much interested in Mr. Tilley's case which he described, owing to its similarity to mine. I saw my patient sixteen months ago when he had what I took to be acute œdema of half his larynx: but it was not of globular outline, and it seemed to occupy various laryngeal structures. I thought that if there was a cyst wall it must be very thin. But this wall is so tough that I had the greatest difficulty in punching out a portion. Within a week it had re-united and filled, and some further infection took place. It has been in its present condition seven months.

(*February* 2, 1917.)

Sarcoma of Ethmoid and Superior Maxilla in a Man aged 39.

By H. J. BANKS DAVIS, M.B.

THE disease first showed itself in the form of a swelling over the left antrum, with bulging and œdema of the palate. In February, 1916, the antrum, which contained pus, was opened, and as the growth was obviously malignant, after a preliminary laryngotomy, the left maxilla was partially resected, and a suitable obturator was worn by the patient

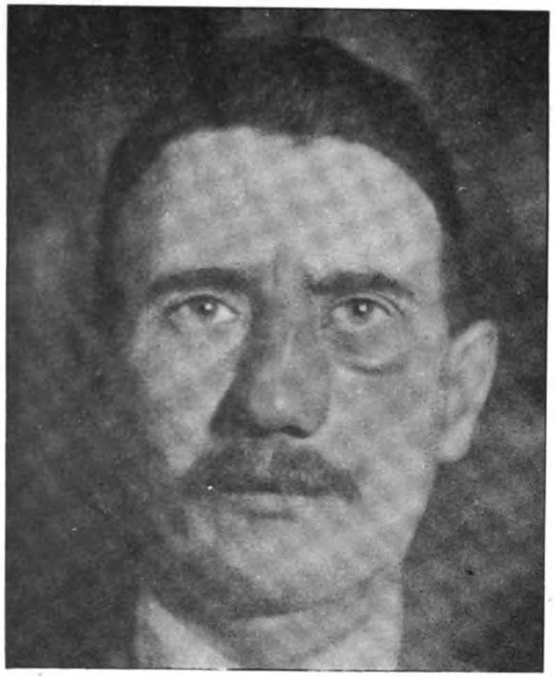


FIG. 1.

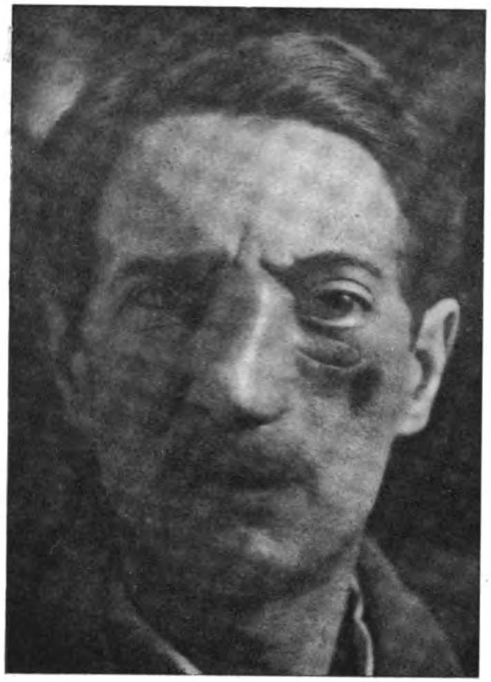


FIG. 2.

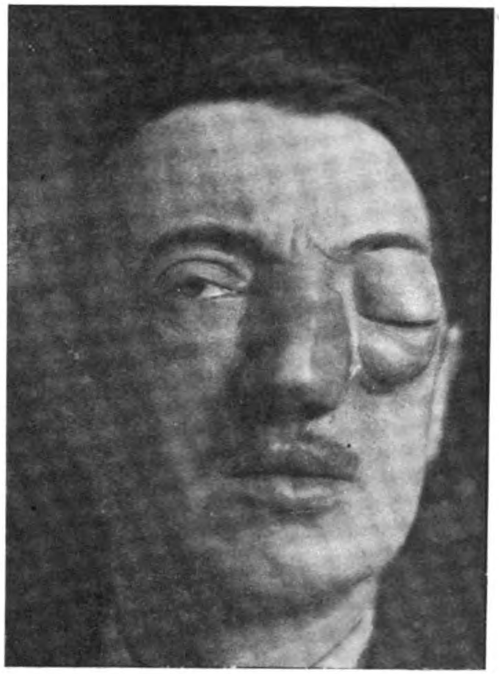


FIG. 3.

for months. He had X-ray treatment from Dr. Morton for several months, and a photograph (fig. 1) shows his appearance when treatment was discontinued.

The second photograph (fig. 2) shows his condition in November last, when he returned saying he was blind in the left eye. I opened up the face again, curetted away masses of bone, but the patient refused to have the orbit cleared. Under treatment at the Radium Institute he improved very much, and was able to follow his profession.

Postscript.—A few days after his exhibition before the Section he was seized with severe pain accompanied by hæmorrhage. He then became blind in the other eye.

The last photograph (fig. 3) shows his pitiable appearance a week before he died, after a third severe operation.

Radium treatment seemed powerless to arrest the rapidity of the growth in the later stages. It was a round-celled sarcoma.

CORRIGENDUM, p. 22.—Dr. DAN MCKENZIE's remarks should read as follows: "I suggest diathermy in the treatment of these adhesions. Has anyone tried to graft the interior of the nose in these cases?"

Section of Laryngology.

President—Mr. T. MARK HOVELL, F.R.C.S.Ed.

(*March* 2, 1917.)

Case of Laryngeal Stridor due to Chronic Osteo-arthritis, relieved by Dilatation.

By J. DUNDAS GRANT, M.D.

THE patient, a woman, aged over 60, had suffered with discomfort in her throat for over fourteen years, and in the early part of 1912 developed a hard cough and noises in respiration observed mainly during sleep. The stridor was extremely marked, and there was complete absence of abduction, the vocal processes remaining in complete contact, there being only a narrow elliptical slit between the cords through which respiration was carried on. At first sight the case seemed to be one of bilateral paralysis of the abductors. Fourteen years previously she states she had an ulcer in her throat, close to the vocal cords, which was cauterized twice a week for six weeks with a brush. The possibility of cicatricial contraction as the result of cauterization was, therefore, considered. She, however, presented distinct signs of chronic osteo-arthritis, and it seemed that this condition was present in the crico-arytænoid joints. A weak spray of cocaine seemed to diminish the severity of the attacks of stridor, but she obtained no marked relief until dilatation by means of Schrötter's tubes was carried out. It cannot be said that even now there is any material movement of the arytænoids, but the elliptical breathing space is certainly larger and the improvement in the respiration is extremely marked.

DISCUSSION.

Mr. TILLEY: I was interested in this case because, on April 1, last year, a colonel, aged 77, bowed down with chronic rheumatism in all his limbs, came to me. The story was that in 1881 he had noticed he had difficulty in breathing. In 1884 he was obliged to retire from the Service on account of constant attacks of breathlessness, and one night he was nearly suffocated by extra severe dyspnœa. In April of last year his stridor was extreme, and there was bilateral adduction of both cords and I thought his condition serious. Radiography did not reveal anything in the chest in the way of new growth or aneurysm: indeed one would hardly expect either of these after such a long history. What was the nature of this adduction of the cords? In view of the general condition of his joints it was imagined he might have fixation of both crico-arytænoid joints. On December 28 last, I was asked to see him at his home. He was practically moribund and died three hours after I left. The "notch" of the thyroid was level with the manubrium sterni, râles in the lung were pronounced and extensive, and he was cyanosed. The laryngeal aspect of the case seems very similar to the one Dr. Grant is now showing. In the absence of a post-mortem examination, it was impossible to say whether there was any lesion pressing on either recurrent laryngeal nerve. If we exclude new growth and aneurysm in such a case, we are left with the possibility of a condition such as is illustrated by the present case.

Sir STCLAIR THOMSON: In this, as in similar cases, the last diagnosis we should give is fixation of the arytænoid joint, because I believe it is one of the rarest occurrences in laryngology, and absolutely proved cases of it are few and far between. This case seems to me more like cicatricial stenosis, with the interarytænoid space gone; for the cords are almost joined to one another. It is like a condition I have seen in a number of cases of tuberculosis, in which spontaneous healing takes place at the interarytænoid region, and the scar tissue draws the posterior ends of the cords so close together that in some cases I have had to do tracheotomy. On watching the present patient's arytænoids carefully when she is asked to phonate, the arytænoid is seen to swing on its base, particularly on one side. So I ask whether all other conditions have been excluded. I do not suppose this is tubercular, but it may be an old syphilitic case, and perhaps the Wassermann test may help us. Passing from that aspect, I would ask: "Why spare tracheotomy in such a case?" It seems a pity considering that tracheotomy is such a simple and safe procedure, and can be done without a general anæsthetic. This patient has had her discomfort fourteen years, and I do not see why she should not enjoy life, and I see no objection to her having a tracheotomy tube, especially as she may be able to discard it at a future date. Meantime it would also afford rest to the larynx. If the trouble is mechanical, she could wear an O'Dwyer's tube, which will produce successful dilatation.

Dr. W. HILL: A prolonged case of abductor paralysis is liable to end in immobilization, partial or complete, of the crico-arytænoid joint. Why that takes place I am not prepared to say, but I assured myself it was present in one case. In that case, one vocal cord was completely paralysed, as the result of an operation for goitre many years before. The arytænoid was fixed in a bad position: the cornicula pointed towards the middle line, whereas in Dr. Grant's case the vocal processes are in approximation. In my case, I was able, with my finger, to feel the arytænoid on the paralysed side, and it was as immobile as if it were ankylosed to the cricoid cartilage. I thought I should be able easily to take away that cartilage with forceps by the direct method, but it was so fixed that it would have needed to be cut out, and I did not do it. At a later date I did laryngofissure, for something else, and I then felt the joint again, and pointed out to those present that the joint was immobile. The deformity present there was the opposite to that in Dr. Grant's case. Conceivably this is a post-paralytic contracture of the muscles of the joint, which has become so fixed that the arytænoids do not move. [Drawing and demonstration.] I recommend Dr. Grant to try the following method: Put down a direct vision tube, and then put down the metal end of a pencil protector—of course without the rubber—on to the cornicula, and then see if the arytænoid will oscillate. In my case, the arytænoid on the immobile side would not move, but the other side was freely movable.

Dr. F. de HAVILLAND HALL: After the discussion we have had on this case, I hope that if Dr. Grant intends to continue the use of Schrötter's tubes, he will have the great patience which such treatment will demand. I remember that in my early and enthusiastic days I had experience of dilatation of the larynx, and I found it most disappointing. If, in the case of the out-patient department of the hospital, the patient failed to come at the due date, the condition, when next he came, was found to have relapsed in a most discouraging manner. I have come to regard the means as almost hopeless, especially in the case of out-patients.

Mr. CYRIL HORSFORD: Two or three days ago I saw a case of typical double abductor paralysis, for which I could find no cause: there were no signs of growth in the mediastinum or the neck, nor anything to throw light on the cause of the condition. The stridor, though obvious, was not alarming. I advised her doctor that, before it got too late, tracheotomy should be done, at the same time pointing out that she would be able to use her voice well. I stated what I believe is Semon's law, that eventually, when the paralysis becomes complete, the cords recede until they occupy the cadaveric position. I ask whether that is so. If so, it does not appear to confirm Dr. Hill's theory that the cords become fixed in an awkward position. If the later stage is adductor, not abductor, paralysis, one would expect to be able to promise, after some time, that the tube could be removed. That is a strong recommendation for the early insertion of a tube. I shall try to induce my patient to come and show herself next time. It has been going on for four years.

Dr. DONELAN: About ten years ago I showed the case of a lady who had caught cold and got fixation of the left arytænoid. The case was diagnosed by Sir Henry Butlin and Sir Felix Semon and others as rheumatic fixation of the arytænoid cartilage. I mention it because of what Mr. Cyril Horsford has just said as to the position of the cord. The cord lay in the cadaveric position, and had done so from the first. I was glad to have my impression that it might be a syphilitic condition in this case anticipated by Sir StClair Thomson. It looks very much like a case of old syphilitic stenosis I saw recently in which there was fixation by similar bands of adhesion.

Dr. DAN MCKENZIE: I do not know whether Dr. Grant has examined the case by hypo-pharyngoscopy. I have seen the method described as rough, but I do not find it upsets the patient at all, and it is easily applied. Arguing on the grounds of probability, one would say that osteo-arthritis of the crico-arytænoid articulation would be unlikely to result in such a position of both arytænoid cartilages as to bring both cords simultaneously into the position of adduction. I think it would be useful to have the larynx skiagraphed. I remember one case in particular in which the cord lay in abduction, and it was a simple matter to examine the patient by hypo-pharyngoscopy, and one then saw a great swelling behind the arytænoid of the affected cord. It persisted many years, and I concluded there was a chronic change in the bone.

Dr. DUNDAS GRANT (in reply): I thank members for their remarks. I think, with Mr. Tilley, that the two conditions are associated: it could scarcely be a mere coincidence, though there is much in what Sir StClair Thomson says as to the possibility. The appearance is such as would be produced by such a cicatricial contraction as he and I have seen in tuberculosis: I saw it also in one case in which applications of trichloracetic acid had been too zealously made for the destruction of tuberculous nodules in the inter-arytænoid space. That patient had very distressing stridor, which, however, settled down later. I think the possibility of bilateral paralysis of abductors may be left out of account. The reason which Dr. Hill adduced is incontrovertible. The patient has been very greatly benefited by the introduction of these tubes, even at longer intervals, and she has never gone back to the condition she was in before. I have not practised hypo-pharyngoscopy in this case, but I looked carefully for distortion of the joints. I think Sir StClair Thomson found there was none. I admit it is a weak spot in the diagnosis of arthritis, because in a paper which Sir Felix Semon published a number of years ago, he said swelling of the joint was one of the characteristic features. X-rays have not yet been used in the case, but I think they might be with advantage. I think the suggestion as to tracheotomy is a most appealing one, and probably that will be the ultimate solution.

(*March* 2, 1917.)

Case of Symmetrical Fibromata on the Vocal Cords, removed simultaneously by means of the Exhibitor's Forceps.

By J. DUNDAS GRANT, M.D.

THE patient, a fish-hawker, aged 36, suffering from extreme hoarseness of eleven months' duration, came to Brompton Hospital and was referred to the throat department. There were elongated sessile fibromata covering the middle of the edges of both vocal cords. The case seemed to invite the use of the exhibitor's so-called "safety" intralaryngeal forceps, and at one introduction the fibromata were cut off with absolute completeness on the left side and almost absolute on the right; the voice was at once completely restored; the small recurring tags on the right side were destroyed by means of the galvano-cautery.

DISCUSSION.

Dr. DUNDAS GRANT: There has been a recurrence since then, as the man has been using his voice, so the case is not yet a cured one.

Dr. DAN MCKENZIE: I cannot refrain from once again speaking of the great usefulness of Dr. Grant's laryngeal forceps. Some time ago I tried to remove a little growth from the cord by the indirect method, and I used his forceps. I was delighted at the ease with which the fibroma was produced.

Dr. WILLIAM HILL: I have used Grant's forceps for the direct method. I have had them made straight for the purpose. I think they are about the best forceps one can use for small growths projecting from the cords.

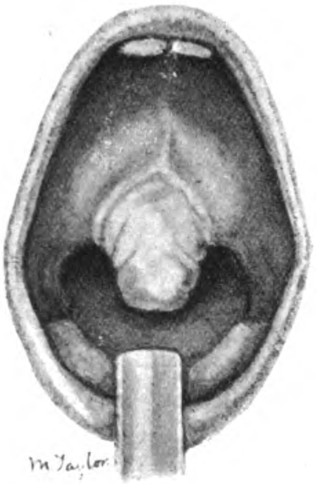
Mr. CYRIL HORSFORD: I have not used Grant's forceps for growths on the vocal cord. I think this is a good opportunity to bring up one point for discussion—namely, as to the advisability of using the galvano-cautery for the destruction of simple growths on the edge of the vocal cords. It is done by many laryngologists, but I regard it as a most dangerous operation, and from the artistic point of view, especially in the case of singers, the result is fatal as regards the voice. I think it would be valuable to hear a few experiences and views as to the suitability or advisability of the method.

(*March* 2, 1917.)

Lupoid Tuberculosis of the Pharynx in a Boy, aged 8, affecting the Soft Palate and Uvula.[1]

By Irwin Moore, M.B.

Patient, who was first seen on January 16, complained of a swelling in the neck under the chin, which was first noticed eight months ago. On examination, a semi-translucent swelling affecting the uvula was seen extending over the greater part of the soft palate, which, on palpation, felt solid, rigid, and leathery. The tonsils were not enlarged. Some adenoids which were present have since been removed, and were found to be tuberculous. The submental glands were enlarged and matted together, also enlarged discrete glands were present on both sides of the neck and in the inguinal region. There were no signs of pulmonary disease. With the exception of ulceration of the mouth when he was a year old, patient has been healthy, and has always had a good appetite.



Lupoid tuberculosis of the pharynx affecting the soft palate and uvula.

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[1] The original title given to this case was "Lymphadenoma (Hodgkin's disease)," but in view of the opinions expressed, and a later examination of the lungs showing slight active tuberculosis, it has been changed to "Lupoid Tuberculosis."

Patient has been treated for six weeks with potass. iodide, and the submental glands have considerably decreased in size but the condition of the pharynx is unchanged.

BLOOD REPORT (DR. EASTES' LABORATORY) ON FEBRUARY 16.

Number of red corpuscles	4,390,000 per cubic millimetre.
Number of white corpuscles	19,500 ,, ,,
Amount of hæmoglobin	70 per cent. of the normal.
Colour index	0·83.

Differential Count of 400 *White Corpuscles.*

Small lymphocytes	27 per cent.	40 per cent.
Large lymphocytes	13 ,,	
Polymorphonuclears		57 ,,
Eosinophiles		3 ,,
Mast cells		0 ,,
		100

No poikilocytosis was observed. There is occasional "stippling" of the red disks.

Histological report on adenoid tissue removed from nasopharynx: "The lesion is undoubtedly tuberculous."

DISCUSSION.

Dr. JOBSON HORNE, commenting on the description of the case printed on the agenda paper as "Lymphadenoma (Hodgkin's disease)," said: Before labelling the case as one of Hodgkin's disease we should remember that the term covers a large number of conditions, and that the growth removed from the nasopharynx is, in the opinion of the histologist, tuberculous. I could, had I known, have brought some specimens to compare with the one exhibited. Many years ago I did research work on the subject,[1] and from the same body I was able to demonstrate in the glands typical Hodgkin's disease, lymphosarcoma, and tuberculosis. I think we need to be a little more precise in this case.

Dr. DAN MCKENZIE: There is the fact that the submental glands are enlarged and matted together, which is not in favour of lymphadenoma, in which the glands remain discrete, there being no peri-adenitis to mat them together. Dr. Horne's opinion that the lesion is tuberculous is interesting, because I have heard him say that when multi-nucleated giant cells are found, one should be careful before calling it tuberculous. Lymphadenoma begins invariably in the cervical glands. I think it commonly affects the tonsil as well as the tonsillar gland, and this gives us the idea that whatever does produce lymphadenoma obtains entrance by the tonsil. Removal of the tonsils in lymphadenoma, even in an early case, however, has no effect on the course of the disease.

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[1] "The Larynx—a Site of Infection in Certain Diseases of the Lymphatic Glands known as Lymphadenoma, Lymphosarcoma, Tuberculous Adenitis, with a Note on Primary Tuberculosis of the Organ," *Journ. of Laryng., Rhinol., and Otol.*, December. 1901.

Dr. JOBSON HORNE: At a future meeting I shall be pleased to demonstrate specimens which illustrate the points I have raised. Another point is the part played by the larynx in Hodgkin's disease. In some cases I found ulceration in the larynx, and that, and not the tonsil, was the site of the infection.

Mr. FRANK ROSE: I agree with Dr. Jobson Horne's remarks as to the difficulty in establishing the diagnosis of Hodgkin's disease, or lymphadenoma. My experience is that in the post-mortem room a considerable proportion of the cases turn out to be something else, mostly tubercle. Before accepting that diagnosis in this case I think we require more convincing evidence.

(*March* 2, 1917.)

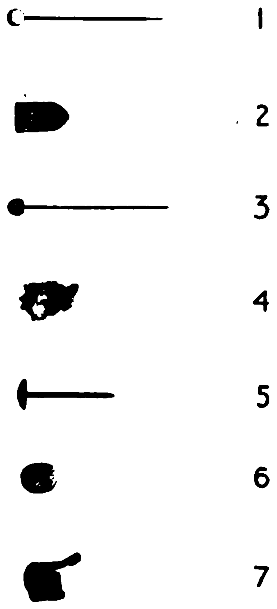
A Series of Twenty-four Foreign Bodies removed from the Air and Food Passages, with Indications as to the Lessons to be derived from some of the Exhibitor's Experiences.

By HERBERT TILLEY, F.R.C.S.

THE point accentuated in certain specimens in this series is the one raised by Dr. Irwin Moore—viz., that it is inadvisable to use blind instrumentation for the removal of foreign bodies from the air and food passages.

In one of the patients I was asked to remove a coin from the upper part of the œsophagus of a hospital patient, but before I arrived there an enthusiastic house-surgeon tried to get the coin out with a coin-catcher. When I employed œsophagoscopy I could not find the coin in the gullet, and immediately afterwards a skiagram showed it was in the stomach; it had been pushed down by the ineffectual attempt to remove it with the coin-catcher. It was duly passed *per anum.*

Another case occurred in a soldier (fig. 7), in whom a portion of shrapnel casing lodged in the larynx, attention having been directed to it by hoarseness. I saw something black in the left ventricular band, and decided to try to remove it by the direct method under general anæsthesia. It slipped away from the forceps and disappeared. As the patient was struggling most of the time, I obtained permission to bring an expert anæsthetist the following week, and we found the foreign body in the left bronchus, where it had been located by the X-rays in the interval. The lesson to be learnt is that for the removal of foreign bodies from the larynx the patient should be in the



Bronchoscopy. Foreign bodies removed from the air and food passages by the direct method (bronchoscopy and œsophagoscopy). (1) Shawl-pin removed from left bronchus of adult female after two weeks' impaction ; (2) metal pencil cap from left secondary bronchus, patient aged 9; (3) pin removed from left secondary bronchus of female, aged 23, after six weeks' impaction (vide *Lancet*, November 7, 1908) ; (4) portion of mutton bone removed from right bronchus of female after ten days' impaction (vide *Lancet*, April 22, 1911) ; (5) nail from right bronchus of female, three weeks' impaction ; (6) pea from right bronchus of old man (*vide* present communication) ; (7) portion of shrapnel casing from left bronchus (*vide* present communication).

Trendelenburg posture, so that gravity does not aid the foreign body in gaining a deeper position. Also, one should have bronchoscopic instruments handy, in case the body slips from the larynx to a deeper region.

In another case (fig. 6), which was shown at the International Medical Congress in London, a pea had lodged in the right bronchus of an old man. Since it would have been futile to try to crush the pea and bring it out, we passed a bronchoscope on to it, and inserted a plug of wool soaked in paraffin, until it was close on the foreign body, and then by sudden withdrawal of the improvised piston the intruder was brought into the tube and readily extracted.

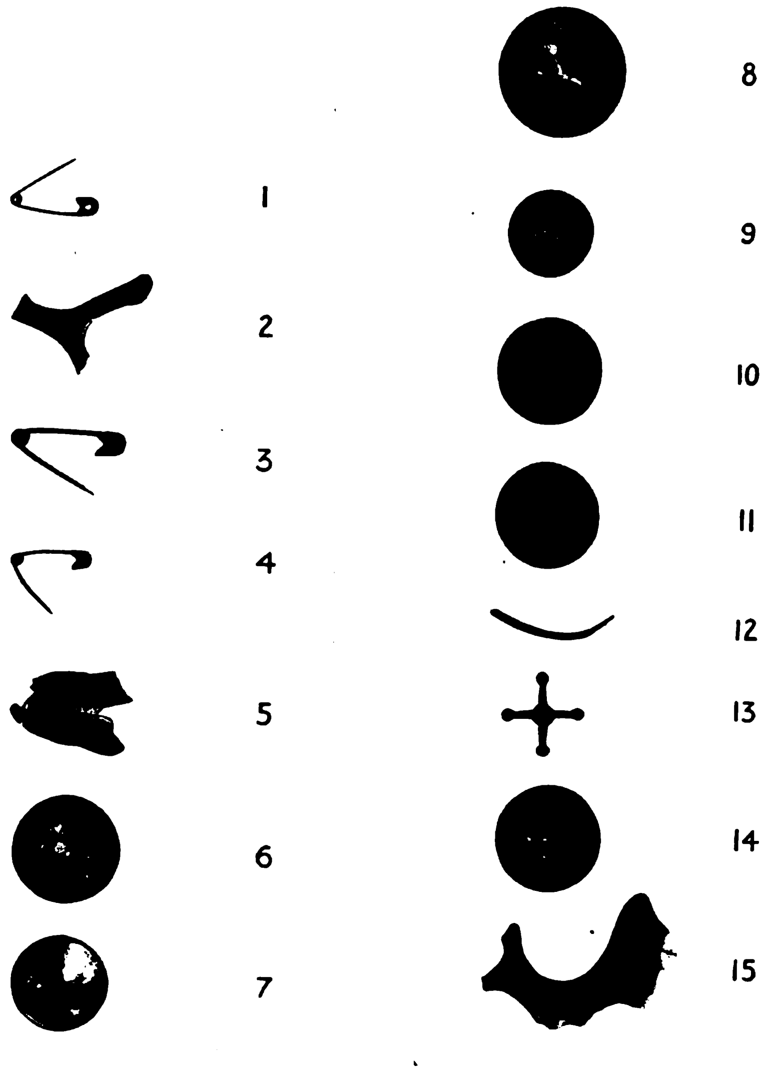
One of the three safety-pins (figs. 1, 3, 4) was removed last Christmas Day morning. It had been swallowed forty-eight hours previously. The matron and the house-surgeon of a hospital considered the patient's story to be fanciful. As the symptoms persisted, a skiagram was taken and the pin located. I succeeded in removing it quite easily with a Mosher's œsophagoscope. The moral of this case is that the history given by a patient concerning a foreign body should not be pooh-poohed or neglected. It is always safer to have a skiagram taken.

The turkey bone (fig. 2) was removed from the gullet of the wife of a medical man. Her husband tried on three occasions to push it further down with a probang. The result was some ulceration of the œsophagus. We removed it easily by the direct method (Mosher's distal lighted œsophagoscope).

This specimen (fig. 5) is from my youngest case of a foreign body. The patient was a baby aged 4 days. The nurse had given the child a "comforter" to suck, the inside of which was filled with cotton wool. The child detached the comforter from the shield and swallowed it; the secretions of the gullet made the wool swell and the œsophagus was obstructed, so that nursing at the breast was impossible. We removed the foreign body by means of a small bronchoscope.

In another instance a message came to my house from University College Hospital that a child had swallowed a foreign body (fig. 13). I told them to put the patient under an anæsthetic, and I would be round in ten minutes. I removed the foreign body and was back at my house within thirty minutes of leaving it.

The last specimen (fig. 15) was from a fatal case. A man was sent into the hospital forty-eight hours after having swallowed a denture during sleep. Before admission, ineffectual attempts had been made by means of a probang to push it into the stomach. The lower pharyngeal regions were obstructed by œdematous swellings, the breath was foul, and the whole area was bathed in purulent secretion. We found our way into the œsophagus, and saw the denture lying in a greyish-green surrounding. We took hold of it with forceps and removed it without



Œsophagoscopy. (1, 3, 4) Safety pins removed from gullet (*vide* present communication); (2) turkey bone (*vide* present communication); (5) teat of "comforter" from gullet of baby, 4 days old (*vide* present communication); (6, 8, 9, 10, 11, and 14) coins—a penny (8), halfpennies (6, 10, 11, and 14), farthing (9); (7) coachman's button; (12) portion of rabbit's rib, impacted one week; (15) denture swallowed during sleep, blind instrumentation caused death (*vide* present communication).

difficulty, but the patient died forty-eight hours afterwards. Post mortem, three perforations were found in the side of the œsophagus close to the foreign body.

I show these foreign bodies and skiagrams in order to help in establishing the rule that at the present moment when endoscopes are so numerous, and there are so many experts to use them, it is unjustifiable to attempt the removal of foreign bodies in the air or food passages by blind instrumentation.

(*March* 2, 1917.)

Pin in Bronchiole of Posterior Lobe of Right Lung.

By HUNTER TOD, F.R.C.S.

(Read by Mr. NORMAN PATTERSON.)

GIRL, aged 12, admitted to the London Hospital on November 29, 1916. The mother stated that on the previous evening she fell off a chair whilst holding a long pin between her teeth. The girl complained of no symptoms, but as her mother could not find the pin she brought the child to the hospital to be X-rayed.

The pin appeared to be low down in the right bronchus with the head lying downwards. On the day of admission I passed a bronchoscope (medium size) along the right bronchus until it could be pushed down no further; the distance measuring 13½ in. from the teeth. A good view of the openings into the bronchioles could be obtained, but the pin could not be seen.

Two days later another attempt was made under the guidance of an X-ray screen. A photograph was taken when the bronchoscope had been inserted at a distance of 10 in. from the teeth. It shows it to be in the right position, although some way from the pin.

A third attempt was made a week later (December 8) also under the guidance of an X-ray screen. When the patient was lying on her back it seemed as if the bronchoscope had almost reached the pin, and that a pair of forceps passed along it would pass over the pin; but on turning the patient on her side it was found that the bronchoscope and forceps were well in front of the pin. It seems, therefore, that the pin is situated in the lower posterior bronchiole.

The patient suffered no inconvenience as a result of these examinations. She was kept in the hospital until January 12, over five weeks after the last examination.

An X-ray photograph, taken two days ago, shows the present position of the pin, which does not seem to have moved. The patient is still in the best of health and has no cough nor expectoration.

The points on which I would like the opinion of members of the Section are the following:—

(1) Should a further attempt be made to extract the pin through the bronchoscope or should it be left *in situ?*

(2) Is there more danger in leaving it *in situ* and risking an abscess of the lung than in making further attempts at extraction?

(3) Is this a case for surgical interference and for direct removal of the pin from the lung by an intrathoracic operation?

My own opinion is that nothing further should be done because as the patient is still in the best of health it is probable that the pin has become encysted and may give rise to no further trouble.

The surgical view that foreign bodies in the lung always lead to an abscess is not necessarily correct, because if a patient keeps well in spite of having inhaled a foreign body, unless the fact is known and the case is X-rayed, as in this particular case, such a condition may never be suspected.

DISCUSSION.

Dr. IRWIN MOORE: Mr. Hunter Tod's case relates to one of the few foreign bodies in the lungs which are out of reach of the bronchoscope. I understand that this pin has not yet been located by the bronchoscope, though it has been demonstrated by the X-rays. It is evidently situated in a posterior branch of an inferior lobe bronchus, and the only endoscopic tube we have that can be used in a child of this age measures 13 in., and this would not pass along the smaller bronchi nor reach the pin. Mr. Somerville Hastings had a similar case at the Middlesex Hospital in 1912, where a child aged 4½ aspirated a 2 in. shawl-pin into the lung. Many attempts at removal with the bronchoscope, even through a low tracheotomy opening, failed. A month later Mr. Kellock[1] performed pneumonotomy and successfully removed the pin. It was situated ¾ in. above the diaphragmatic surface of the lung. There was no associated empyema, and the child made a complete recovery. Chevalier

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[1] Thomas H. Kellock, "A Case of Pneumonotomy for Foreign Body," *Proc. Roy. Soc. Med.*, 1912, vi (Clin. Sect.), p. 64.

Jackson, in his latest book on "Per-oral Endoscopy," refers to a few exceptional cases of failure which he has had, as beyond the limitations of bronchoscopy, and they were foreign bodies in a lower lobe bronchus, and out of reach. He considers that in such cases, if the foreign body is not extracted, an abscess always forms, sooner or later, and he records a case in which a pearl collar button remained in the left bronchus for twenty-six years before abscess formation occurred.

Mr. NORMAN PATTERSON: I think the pin in Mr. Tod's case might be got at by doing a tracheotomy, and carrying out inferior bronchoscopy.

Dr. D. R. PATERSON (Cardiff): I agree with Mr. Norman Patterson as to the advantage of tracheotomy in these cases, because it enables one to get nearer the foreign body, and a larger tube can be used. For a really good search in the lower parts of the bronchus, tracheotomy gives great advantages. I have adopted it twice in cases of very small children. In one case I found removal to be impossible through the larynx, but after doing tracheotomy it was manipulated without the slightest difficulty.

The PRESIDENT: Has strapping the child to a board, and more or less inverting it, been tried? It could not do any harm.

Sir StCLAIR THOMSON: These are most interesting cases, and there are many lessons to be drawn from them. One would like to study the histories in detail. One lesson is the use of suction, which would be very useful in cases of bodies impacted in a secondary bronchus. The air behind it is absorbed, and in getting it out there is the negative pressure on the opposite side. A foreign body seems to slip out of our forceps, and in some cases we think it catches at the end of the bronchoscope or œsophagoscope: yet we know that if we go at it again and remove the whole *en masse*, we are much more successful. So now, when I feel I have seized the foreign body, I remove the whole thing *en bloc*, and in doing so, I think the suction made by withdrawing the tube helps us very much. I had a case in which I saw a pin projecting from a secondary bronchus. I got hold of it; there was a gush of mucus and I lost sight of it. I let go, and withdrew the tube, which was full of mucus. I wiped it, and went in again, but there was no pin to be found! I took out the tube to have a rest, and when I turned up the lights the pin was seen on the floor. It had come out with the first gush of mucus. We know that to break up peas in the lung is a deadly proceeding. With regard to Mr. Tod's case, has anyone used the electro-magnet for such a case? I have seen surgeons use it, and they said their object was to get the pin simply to shift its position. This might help to get the pin from the secondary bronchus to the primary bronchus.

Dr. W. HILL: Iglauer has used the electro-magnet, and found it useful for metallic foreign bodies which were non-impacted, but when they were impacted it did not shift them. So in America it fell into disrepute on account of failure in just those cases where it was required. With regard to the method of suction, I have shown a piece of chestnut, a portion of which was just projecting from a secondary bronchus. I could touch it with a sharp hook, but it would not come out. The patient was aged 13 months. I deliberately applied suction. I passed a glass tube down through the bronchoscope and connected the tube with a suction bottle. I got the piece out by this means, but on looking again into the bronchoscope I saw a second piece, which had dropped off the tube. At that moment the child gave an inspiration, and the second piece of chestnut disappeared from the endoscope, and went down the right bronchus. On following it up without cocainization, there was a spasm and cough, and the piece was ejected against my spectacles. With regard to Mr. Tod's case, I suppose most of us will advise him to leave it alone, but I do not know whether it is good advice. If the patient gets bronchiectasis, it should be more easy to find.

Mr. TILLEY (in reply): In answer to Dr. Paterson, I removed the safety-pins through Mosher's tube, with a distal light. In all endoscopic work I prefer distal illumination to the proximal light afforded by Brünings's instrument.

Mr. H. J. BANKS DAVIS: Three or four years ago, it occurred to me that using such an instrument as a magnet might enable one to remove these pins and needles. Several attempts to magnetize the fine gripping forceps were made for me by an electrical engineer, but, owing to the length of the instrument, it was found not possible to magnetize the tip—which after all is the most important part—but I do not see why this difficulty should not be overcome.

Dr. KELSON: With regard to blind instrumentation, an interesting case has just left the hospital. It was that of a man who, just before Christmas, had been eating nuts, when a piece of one stuck in his throat. He stated that on the following day vigorous and painful instrumentation was used with a probang. On the next day he had a swelling in the neck, and eight days later he came to hospital with a big brawny swelling on the left side, and the left arytænoid and left ventricular band were much swollen. Nothing could be seen of the foreign body, though he was watched for a few days, and X-ray search made. I made an exploratory incision into his neck, and let out a lot of fœtid pus, and bare cartilage could be felt. The wound continued to discharge for some time, but after opening one or two other abscesses, it has now cleared up.

(*March* 2, 1917.)

Ethmoiditis causing Blindness.

By G. W. Dawson, F.R.C.S.I.

Patient, a woman, aged 27, was sent to me by Mr. Kenneth Campbell on February 9, 1916. He reported optic neuritis of right eye, left eye slightly affected. For six weeks she complained of pain at the back of the eyes and across the bridge of nose; a small quantity of pus was seen in each olfactory cleft.

February 26: Eye report.—Right disk indistinct and pale; left, marked papillitis; elevation, 1½ D. She was almost totally blind and could only distinguish light and darkness.

February 26: Submucous resection of septum, which was thickened and deviated high up. Both ethmoids curetted and found to be necrosed.

In two days her vision was much improved, and on March 6 the ophthalmic surgeon reported a trace of neuritis. On March 31 Mr. Kenneth Campbell reported vision in each eye $\frac{6}{6}$.

(*March* 2, 1917.)

Report of Two Cases of Mutton Bones impacted in the Œsophagus; Œsophagoscopy; Recovery.

By Irwin Moore, M.B.

Case I: The Spinous Process of a Cervical Vertebra.—In May, 1916, patient, aged 62, came to the London Throat Hospital complaining that he had swallowed a piece of mutton bone four days previously. He was unable to swallow any hard food and even soft food caused vomiting. A radiogram, taken by Dr. Finzi, after a bismuth feed, outlined the foreign body about an inch above the level of the sternal notch. Under a general anæsthetic the following day an œsophagoscopic tube of 10 mm. diameter was passed, and the piece of bone was easily located lying across the œsophageal lumen. On passing forceps and attempting to seize the bone by its extremity in order to turn it into its narrower diameter, it was displaced and slipped 2 in. lower. While again applying the forceps through a 12 mm. tube, a paroxysm of retching occurred, due to light anæsthesia, and the bone was vomited up the œsophagoscope on to the patient's face. It measured 24 mm. (1 in.) in length, and 8 mm. ($\frac{5}{16}$ in.) in diameter.

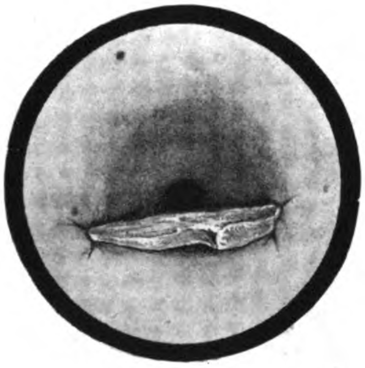

FIG. 1.

Piece of mutton bone, as seen by the œsophagoscope, impacted in the œsophagus in a man, aged 62.

Case II: The Transverse Process of a Cervical Vertebra with Bolus of Meat attached.—Patient, a housemaid, aged 40, swallowed a piece of mutton bone on December 5, 1916, which stuck in her gullet. She was sent to a general hospital, where she was told there was nothing wrong; four days afterwards she returned, and a brush-probang was passed down the œsophagus; then she was again told that nothing was there and sent home. Because she was unable to swallow anything but liquid food, most of which was regurgitated, and because her breath had become very foul, she was advised to go to the London Throat Hospital. When first seen on December 8 her breath was extremely fœtid, this suggesting that sloughing had taken place. Her temperature was subnormal (96° F.). A radiogram was at once taken and it showed a piece of bone impacted in the œsophagus at the level of the cricoid cartilage. The œsophagoscope was passed under general anæsthesia with great difficulty, owing to the patient having a short thick neck, contracted mouth, prominent teeth, and a very stiff jaw. The bone was seen and seized with forceps, but on account of its firm impaction with the surrounding œdema, ulceration, and bleeding — which kept the field obscured — the risk of doing further damage was considered, and attempts at removal postponed. Considerable difficulty also arose during the examination from cessation of breathing four times, and artificial respiration was found necessary. The condition of the œsophageal wall was probably due to the previous ill-advised attempts to use a bougie. On re-examination, two days later, a large piece of decomposed meat was discovered and removed by forceps. Further search was postponed on account of the patient's condition, which required artificial respiration on three occasions. At midnight the patient vomited up the bone during a coughing attack. It measured 25 mm. (1 in.) transversely, and 16 mm. ($\frac{3}{4}$ in.) in length, and consisted of the transverse process and portion of the body of a vertebra, with three sharp and jagged angles. Patient made a speedy recovery, and left hospital a week later.

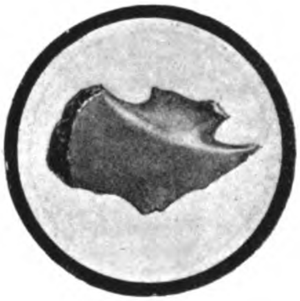

FIG. 2.

Piece of neck of mutton bone impacted in the œsophagus at the level of the cricoid cartilage in a woman, aged 40.

Remarks.—In connexion with the first case it is interesting to note that this is not the first instance of foreign bodies in the œsophagus or bronchi being expelled by vomiting or coughing while the œsophagoscope or bronchoscope were in position and covering the object. It may be useful in some cases to get rid of foreign bodies in this way by stimulating the laryngeal or pharyngeal reflexes during light anæsthesia. The second case was somewhat similar to one reported by Dr. D. R. Paterson, at a meeting of the Laryngological Section on December 3, 1915,[1] the measurements of the piece of bone being practically the same. In that case the patient unfortunately died from septic absorption, six days later, as the result of a lacerated œsophageal wall, probably caused by the previous attempts of a surgeon to pass a bougie. These cases exemplify the serious risks to the patient's life from an impacted bone, and the danger which may follow the use of a bougie; also the importance of an examination by X-rays of all cases in which a foreign body is said to have been swallowed. The great advantages of œsophagoscopy cannot be too frequently emphasized.

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[1] *Journ. Laryngol*, 1916, xxxi, pp. 149-150.

(*March* 2, 1917.)

Infiltration and Ulceration of Vocal Cords; Malignant?

By W. H. JEWELL, M.D.

E. H. W., MALE, aged 53, became hoarse eighteen months ago, and has continued so. He has been a heavy smoker and drinker for thirty years. He has never had any pain, expectoration, difficulty in swallowing, or hæmorrhage. His septum is deflected. Wassermann reaction negative. The anterior extremities of the cords adjoining the anterior commissure have a yellowish glazed appearance, and behind this the left cord is swollen and abraded for the greater part of its extent. The margins of the cords do not meet posteriorly on phonation.

DISCUSSION.

Dr. JOBSON HORNE: The disease, I think, is malignant. It may be more extensive than the mirror would show. The case should be closely watched, and the position of affairs stated to the man, so that he may decide whether he will have the part involved removed as a precautionary measure, or leave it alone. The patient, I understand, has been taking iodide of potassium with some slight benefit.

Mr. CLAYTON FOX: I think it is hypertrophic laryngitis. There is a similar thickening of the opposite cord, more anteriorly, and the man has suffered from marked nasal obstruction, and is working in dusty surroundings. The cord in question is quite mobile, and if it were what it is said to be, with that infiltration, there would, surely, have been some sluggishness in the cord by this time. I have seen a similar case recently which was diagnosed as laryngitis tuberosa. There was fibroid thickening, but the cord has now cleared up entirely under treatment.

Mr. FRANK ROSE: I think there is severe laryngitis in this case, but the localized lesion on the left cord is, to my mind, highly suggestive of malignant disease. I should watch the lesion very closely, and if there is evidence of increase in size, I would recommend that the cord be removed.

Note. — Dr. Irwin Moore's epidiascopic demonstration of skiagrams showing some interesting points in the differential diagnosis and localization of diverticula and strictures could not take place for want of time. In consequence the reports of his two cases of pharyngeal pouches, together with the discussion, have had to be omitted.

Section of Laryngology.

President—Mr. T. Mark Hovell, F.R.C.S.Ed.

(*May* 4, 1917.)

Retainers for Tracheotomy Tubes.

By T. Mark Hovell, F.R.C.S.Ed. (President).

As several members of this Section have asked me for particulars with regard to the tapes with an elastic insertion for retaining a tracheotomy tube in position, as devised and used by Sir Morell Mackenzie and in use at the Throat Hospital, Golden Square, for the last forty years or more and to which I referred in my Introductory Address, I exhibit two specimens.

(*May* 4, 1917.)

Remarks on Treatment of Irritative Coughing.

By T. Mark Hovell, F.R.C.S.Ed. (President).

I have practically discontinued the use of trichloracetic acid for the treatment of irritative cough because I found that, in many cases, it produced a considerable amount of irritation which sometimes continued for several days, and I now employ instead a solution of perchloride of iron, 4 dr. to 1 oz., in equal parts of glycerine and water; but I always write the prescription as 240 gr., as otherwise the chemist is liable to dispense the liquor, which, as you know, contains much more free acid, which is not required and is better omitted.

I may mention also that Messrs. Hall and King, chemists, of Folkestone, have prepared for me, with the juice of garlic, an acetic syrup, an elixir, and an oxymel, all in the proportion of 1 in 5, so that now garlic may be administered by the mouth and thus save the more troublesome method, to which I referred in my Introductory Address, of cutting the cloves into thin slices and wearing them under the soles of the feet between two pairs of socks. These preparations are not disagreeable, and with the addition of honey or treacle they will be readily taken by most children if they dislike the preparation in its crude form. The dose of the juice of garlic as prepared by Martindale is 10 to 30 minims.

Although garlic will destroy the micro-organism of whooping-cough it must not be forgotten that, for the cure of the cough, an astringent must be applied to the lingual tonsil.

(*May* 4, 1917.)

Case of Adherent Soft Palate.

By G. W. DAWSON, F.R.C.S.I.

PATIENT, a male, aged 23. At the age of 12 he had a sore throat which lasted two years, and for which he was treated at the London Hospital. However, when he was aged 16 the nasopharynx became closed, and he states that he was operated on four times and wore a tube in his nose for six weeks. When I saw him in October, 1916, the post-nasal space was completely shut off from the pharynx, and he was rapidly going deaf. In November I made an opening in the adherent palate, which was very thick, and introduced a rubber tube, which he has worn ever since, with great benefit to his hearing and general comfort. Wassermann's reaction was strongly positive.

DISCUSSION.

Mr. HERBERT TILLEY: This patient will be relieved, but only so long as the tube remains in position, and I should like to know how long Mr. Dawson proposes to leave it there, and how long he thinks it will be before the edges are covered with epithelium. If his method fails, perhaps he will feel inclined to adopt the method I described some years ago, when I showed two cases some months after operation. It entails dividing the adhesions between the palate and the posterior wall of the pharynx, and inserting a silver-wire suture from before backwards at the junction of the soft and hard palate, letting it pass over the posterior free surface of the soft palate, to re-enter it on the posterior aspect of the free margin of the soft palate. The two strands are brought forwards and fixed over one of the incisor teeth. This is done on each side of the mid-line, and the wires are allowed to stay in a week, or until they cut out. This is a modification of a method described by Mr. W. G. Spencer many years ago at the old Laryngological Society.

The PRESIDENT: There is one method of preventing adhesions which is not generally known. About seventeen years ago, a young lady had her soft palate very seriously torn at an operation for removal of adenoids. When I saw her, extensive adhesions had formed between the soft palate and the posterior wall of the nasopharynx, leaving only a small aperture. Sir Frederic Eve, who performed the operation for me, had a prepuce which he had removed immediately before the operation commenced, which he split and stitched to the edge of the soft palate and base of the posterior pillars. The result has been extremely satisfactory. I saw the patient a year ago, and a free opening still remains. I agree with Mr. Tilley that directly the tube is removed from Mr. Dawson's patient, the opening will close; but if it were to be operated upon as Mr. Tilley suggests and then some mucous membrane stitched on, the result might possibly be good.

Dr. JOBSON HORNE: The note that the Wassermann reaction was strongly positive is the all-important factor in this case. I have had excellent results in two traumatic cases such as the President described, but we know the tendency for plastic adhesions to form in syphilitic cases.

Dr. DAN MCKENZIE: I should like to advise members against operating on these cases unless they are sure that the activity of the original malady has ceased. I say that because I have, by operating, set up again an amount of ulceration which ultimately left the patient decidedly worse than he was before.

(*May* 4, 1917.)

Case of Nasopharyngeal Fibroma.

By G. W. DAWSON, F.R.C.S.I.

PATIENT, a boy, aged 14½, complained of nasal obstruction for six months. Swelling appeared at the right anterior naris two months before operation. There was slight swelling of the right cheek. He was in no pain, but was very drowsy. On October 20, 1916, after a preliminary laryngotomy, the growth was removed. It was found very dense and tough, attached to the roof and right side of nasopharynx. The antral wall was eroded and admitted a finger.

DISCUSSION.

Dr. IRWIN MOORE: Were there attacks of hæmorrhage before the operation? The growth is either recurring, or has not been completely removed. Might it not be a fibroma originating in the nose from the ethmoid or the antrum, with adhesions in the post-nasal space?

Dr. PEGLER: Mr. Dawson asked me to look at his section, and I conclude at once it is not a true nasopharyngeal fibroma, but a diffuse angio-fibroma, which has taken to growing into the nasopharynx. A true fibroma is not very vascular: the difference between the two types is very considerable from the point of view of vascularity. Pure nasal fibromata are very rare.

Dr. JOBSON HORNE: I agree with Dr. Pegler. The angiomatous element is the more important of the two. I agree also that, in most cases, these spring from the basisphenoid.

Mr. DAWSON (in reply): My first case had been operated upon four times, and when the man came under my observation he was distressed by the amount of deafness, which was rapidly becoming worse. That decided me to reopen, and see what would happen. Immediately it was opened he recovered his hearing, and expressed himself as feeling generally better. I found the scar tissue more than ½ in. thick, so that one could not manipulate it; so I think it would have been very difficult to carry out the wire treatment. If the tube is left out a few days, closure occurs: I leave it in because the patient prefers it so, and is then more comfortable. In my second case the fibroma protruded from the front of the nose, and bulged the palate downwards. It was attached to the roof and side of the nasopharynx, and its broad attachment was very tough, so that it was difficult to make any impression on it. With a raspatory and strong forceps I removed it piecemeal, as best I could. I could not get it all away because the boy collapsed towards the end of the operation. The growth caused an opening in the antral wall; one could introduce the finger past the tumour, and the opening felt as if it were eroded. I have no doubt it was due to pressure. He only had several slight hæmorrhages before. During the operation hæmorrhage was severe.

(*May* 4, 1917.)

Case of Right Optic Neuritis caused by Suppuration in the Right Posterior Ethmoidal Cells and Sphenoidal Sinus.

By E. D. DAVIS, F.R.C.S.

A. B., A FISHMONGER, aged 49, was sent to the hospital by Mr. McMullen, who found right exophthalmos, with restriction of movements of the right eye in all directions. Right optic neuritis and loss of sight. Vision, $\frac{6}{36}$. The loss of sight was of four weeks' duration, and exophthalmos two weeks. The left eye was normal.

On December 29, 1916, I examined the nose and I found tenderness of the floor of the right frontal sinus. No tenderness on pressure of the eyeball, or during movement of the eye. The nose showed polypoid middle turbinals, with pus in the right olfactory cleft: the signs of right nasal sinus suppuration were obvious. There was no suppuration of the left side. The maxillary and frontal sinuses were dark on both sides. The right maxillary was syringed out with a Killian trocar and contained no pus. X-ray: Small right frontal sinus; no evidence of cause of exophthalmos.

January 2, 1917: About six weeks after onset of defective sight, both middle turbinals were removed, the right ethmoidal cells and sphenoid were opened. The fronto-nasal duct was enlarged and a right intra-nasal antral operation was performed. Pus was *only* found in the posterior ethmoidal cells and sphenoid. The maxillary sinus was normal.

February 2: Mr. McMullen reported the eye to be practically normal, vision $\frac{6}{12}$, and that the exophthalmos and optic neuritis had disappeared.

A chart of the field of vision is shown.

DISCUSSION.

Mr. MOLLISON: It is not entirely proved that Mr. Davis's operation restored the patient's sight. I have seen these cases of blindness coming on for no obvious reason, and have removed the middle turbinal once or twice, simply in order to feel that I had left nothing undone, and in a month or so the patient recovered. But we cannot say that because the recovery followed an operation, such as the opening of the posterior ethmoidal cells, that these cells were the only cause of the blindness.

Dr. DAN McKENZIE: Although what Mr. Mollison says about retro-bulbar neuritis is true, we know that the condition clears up spontaneously. Yet here there was definite purulent disease of the nose and the nasal sinuses; and at this time of day I do not think one can doubt that optic neuritis is induced by suppuration of these sinuses.

Mr. DAWSON: I had a very similar case in February, 1916, in a woman. A little pus was observable in each olfactory cleft, but there were very few symptoms otherwise. She had a slightly deflected septum, particularly at the upper part, which rather obscured the ethmoid region above. With the right eye she could only distinguish the difference between light and darkness, and the other eye was little better. I did a submucous resection, and found the ethmoid soft immediately above. I scraped both sides, and in two days she had recovered her sight. Mr. Kenneth Campbell, who sent the case, and saw her thirty days after the operation, reported that vision returned to $\frac{6}{6}$ in each eye. I should like to hear an explanation as to why the recovery of sight was so rapid.

Dr. P. WATSON-WILLIAMS: This is a good example of a kind of case which probably most of us have encountered. There are one or two points to be emphasized in connexion with sinus infection in relation to optic neuritis. The connexion between the two was recognized as far back as the days of Berger, and he introduced the term "canalicular neuritis." I think one of the reasons we have failed to make the advance we might have done, lies in the fact that if there is no gross evidence of suppuration, we are apt to negative the nose as a possible cause of the optic symptoms. We may be unlucky in catching the secretion as it escapes from the sphenoidal sinus: it may be seen at one time, and a few minutes later the evidence may disappear. Given an infective sinusitis, I think it is when the leucocytosis is poorly marked and the secretion is mainly clear mucus and is not at all abundant, that infective conditions of the sphenoidal sinus leading to canalicular neuritis are most apt to occur. The reason is that polynuclears inhibit the organisms to such an extent that when there is much suppuration there is less likely to be toxic absorption, just as when a post-mortem wound does not suppurate there is more likely to be a systemic infection. So we must examine very carefully, and not be guided by the presence or absence of suppuration. We must be particularly suspicious when there is a nasal field contraction or relative scotoma, for then the case is much more likely to be due to sinus disease. When later the manifestations of suppuration are more pronounced, it may be too late to do anything.

Mr. CLAYTON FOX: It is very important, in these cases, to pay particular attention to the condition of the optic disk, especially in the early stages of the neuritis. The first change seen is in the periphery of the disk, and that causes enlargement of the blind spot. That is a very important matter, because it constitutes direct evidence of the periphery of the nerve being involved.

(*May* 4, 1917.)

Case of Left Optic Atrophy caused by Suppuration in the Posterior Ethmoidal Cells, Sphenoidal and Maxillary Sinuses of the Left Side.

By E. D. D. DAVIS, F.R.C.S.

T. S., A WAREHOUSEMAN, aged 57, complained of loss of sight of left eye for ten weeks, and long-standing nasal obstruction. He had nasal polypi for years, which were removed at intervals. The sight of the right eye was becoming slightly misty.

He was seen by Mr. McMullen on June 20, 1916, who found left optic atrophy, the pupil reacting sluggishly to light. No pain on pressure on the globe or on movement of the eye. He could only see hand movements in the upper nasal half of the field of vision. Right eye, vision $\frac{6}{6}$ partly.

Mr. McMullen sent the patient to me for an examination of the nose. Both sides of the nose were full of polypi, with suppuration on the left side. The left frontal sinus and maxillary antrum were dark. Both clear on right. Operation advised as soon as possible.

July 19, 1916: Middle turbinals and polypi removed. Both sphenoids and ethmoidal cells opened. Both maxillary and left frontal sinus opened by intranasal operation. The left sphenoid, posterior ethmoidal cells, and left maxillary antrum, contained pus and polypi.

Three days after operation, the patient volunteered the statement that he could see better with the left eye. He was seen by Mr. McMullen on October 20, three months after operation; the sight of the left eye had improved, the pupil reacted to light, and the periphery of the field of vision was normal, but there was a central scotoma.

A chart of the field of vision is shown.

Mr. E. D. D. DAVIS (replying on both cases): During the last eighteen months, ophthalmic surgeons have sent me sixteen cases of blindness which they called either optic neuritis, or retro-bulbar neuritis. In only two was nasal disease detected, the two now shown. The nasal disease—polypi and suppuration—was obvious, and the sight improved after operation. Early operation gives a better chance of recovery, because cases due to nasal suppuration go on to atrophy, and then whatever is done does not improve the sight. Two cases were instances of syphilitic neuritis, which were treated in the ordinary way with benefit. In one case there was double optic atrophy of doubtful origin. One sphenoid had been operated upon, and I operated upon the other, but found nothing and there was no improvement. Of the other class, so-called retro-bulbar neuritis, there were eleven cases, and in these I examined the nose on several occasions, exploring the sphenoids with the Eustachian catheter. I also explored the maxillary antra, but none of these examinations yielded any result. Wassermann reactions, urine, nervous system and X-ray examinations, and searches for tuberculosis were all negative. Two patients were suspected of tuberculosis, but no evidence was obtained. These cases usually occur in young women under 40, and the degree of visual defect varies. It is usually of sudden onset, and unilateral. In a month or six weeks the sight improves and the patient is much better, but a recurrence is apt to follow. Ultimately there is recovery. What is the cause of that type I do not know: the ophthalmic surgeon suggests there is an intermittent catarrh of the ethmoid or sphenoid, and that the sight improves with the disappearance of the catarrh, more particularly as the onset of retro-bulbar neuritis is sometimes accompanied by a history of an influenzal cold. I had charts of the fields of vision made, so that we might know what fibres of the optic nerve were affected. The outside fibres supply the macular region and, if affected, produce central scotoma. Affection of the nasal side would produce a central scotoma, while the central fibres of the trunk of the nerve go to the periphery of the field. But the charts were of little value: in both the cases which had nasal disease there was a central scotoma and contraction of the field. The retro-bulbar neuritis cases also had a central scotoma and contraction of the field. Two of the patients with retro-bulbar neuritis had slight enlargement of the middle turbinal and the condition of the nose was doubtful, so I removed the middle turbinals and opened the sphenoids and ethmoids with a negative result and no improvement in the sight. I hope members will be able to find something to account for this condition.

(*May* 4, 1917.)

Case of Acute Osteomyelitis of Frontal Bone secondary to Acute Frontal Sinusitis; Operation; Recovery.

By W. M. MOLLISON, M.C.

W. B., MALE, aged 15, attended the Throat and Ear Department at Guy's Hospital on February 22, 1917, on account of pain and swelling on the forehead. He gave the following history: "For several years attacks of epistaxis from the left side of the nose; for some weeks (?) frontal headaches. Ten days ago had 'influenza' and suffered from severe frontal headaches and had discharge from the left side of the nose. This morning the left eye began to swell."

Examination showed swelling over the forehead, most marked over the left frontal sinus; the skin was shiny but not red; there was great tenderness over the whole of the swelling; the left eye was practically closed on account of œdema of the lids; there was some œdema of the right eyelids, but this eye could be opened well. There was creamy pus in the left middle meatus. Temperature 100·4° F. The patient's general condition was good. This examination took place at 4 p.m. and the boy was admitted forthwith.

Operation was performed at 9 p.m.; by this time the œdema had spread very distinctly, both eyes were quite closed by œdema of the lids. The usual incision was made over the left frontal sinus and the sinus opened and pus found; while this was being done the cut edges of the bone were noticed to be oozing minute beads of pus and to be somewhat avascular. It was now realized that extensive removal of bone was indicated; further skin incisions were made—one over the right frontal sinus, which joined the original incision at its lower end across the bridge of the nose; from the centre of this incision across the nose a vertical incision was carried up over the forehead; the flaps thus marked out were reflected up and outwards. Bone was now removed till a healthy cut surface was reached; the frontal bone required removal from one external angular process to the other, and for more than 2 in. in a vertical direction from the fronto-nasal junction; the left ethmoidal cells were found to contain pus and were removed, also the supraorbital crests and a small amount of the orbital roofs. The cut edge of the bone was then mopped with pure carbolic acid.

The patient made a good recovery, and about four weeks later the flaps of skin were replaced and sutured.

DISCUSSION.

Mr. TILLEY: I congratulate Mr. Mollison on having saved this boy's life, because osteomyelitis of the frontal bone is nearly always fatal. Those who wish to inform themselves on the subject cannot do better than consult Dr. Dan McKenzie's article in the *Journal of Laryngology*, 1913. During the last six months I have been asked to see two cases presenting that condition: one not as a result of operation, but a complication of an acute, unrecognized frontal sinus suppuration of influenzal origin. The following were the main features in the case: Intense œdema of the left upper eyelid, chemosis of conjunctiva and some proptosis. Œdema over the supra-orbital region which extended to the neighbourhood of the parotid gland and over the ascending ramus of the jaw. Deep pressure over the region of the frontal sinus caused much pain. Pus present in the left middle meatus. The frontal sinus was opened by an incision just below the level of the eyebrow. Pus and bubbles of air escaped. The whole anterior wall was removed and the inflamed mucous membrane wiped away. Small beads of pus could be seen in the diploë bordering the edges of the sinus. Pus continued to discharge freely from the wound for six weeks and it was irrigated twice daily. Meantime the non-inflammatory œdema of the skin on the left frontal bone continued to spread until it reached beyond the hair-line. The whole of the left frontal bone was then exposed and found to be extensively necrosed in many areas, while in others the bone was inflamed. In removing the necrosed portions, adherent dura mater and cortical substance of the brain came away. In spite of such desperate conditions, the patient has recovered completely although a metastatic abscess in the left breast and an attack of acute facial erysipelas after her return home gave us considerable anxiety. In the second case I adopted an incision which avoids the occurrence of the median vertical scar in the forehead. A transverse incision is made in the scalp beyond the hair-line, extending outwards and downwards to the temporal fossa; from the lower end of this a second incision is made forwards to the external angular process of the frontal bone where it joins the outer limit of the original incision in the eyebrow (for opening the frontal sinus). The small incision in the temporal fossa healed without leaving any visible scar.

Dr. DAN MCKENZIE: I also would like to congratulate Mr. Mollison on the very prompt and efficient manner in which he tackled the case, for to that was due the saving of the boy's life. Even when there is an abscess in the soft parts, one's mind is occupied about the frontal sinus, and if, on getting through the bone we happen to find it diseased, it then requires considerable moral courage to extend the operation sufficiently to get beyond its limits if they are wide. I advise caution in regard to the prognosis of these cases. This boy looks well now, but, unfortunately, in this disease one cannot be sure, until at least six months have passed, that the condition will not return. There have been cases in which the surgeon thought he had removed every bit of disease, and the patient remained well for a considerable time, but at the end of it there was a little puffy swelling in the neighbourhood, and it developed into a recurrence. But we must not be too despondent about these cases, because there have been cases in which prompt and thorough removal of diseased bone has resulted in permanent cure. And if there be no recurrence, in course of time the bone removed is replaced, so that in this case the forehead will be as good as before, as the frontal eminences will be restored. That, however, does not apply to the supra-orbital margins, I fear. My paper[1] showed that the cases which had come on after sinus operation did not recover: the only cases which recovered were some of those which had been dealt with surgically in a very thorough manner, and in which the osteomyelitis had set in spontaneously.

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[1] *Journ. of Laryngol.*, January, February, March, 1913.

Dr. P. WATSON-WILLIAMS: What were the organisms in this case? If these were determined, it might be an indication for treatment which might tend to keep off recurrences. I should also like to know how much bone was removed. The success in this case is certainly a matter for congratulation.

Dr. JOBSON HORNE: Dr. Dan McKenzie said that osteomyelitis is very fatal when it follows operation upon any sinus. Does he include in that the antrum? [Dr. MCKENZIE: Yes]. I should have thought that osteomyelitis following upon operation on the antrum of Highmore would be very rare, and if it did occur, that the patient would very likely recover. I agree as to the grave outlook in these cases generally, in fact I believe external operations on the frontal sinus are more fatal than we think.

Dr. IRWIN MOORE: Mr. Norman Patterson has asked me to show the photograph of a very interesting case of osteomyelitis which started after an operation on the frontal sinus. He operated upon the case twelve times, the whole of the frontal bone being eventually removed. The patient, an Australian soldier, has now rejoined his regiment. Mr. Patterson hopes to speak more fully on it when he returns from France.

Mr. O'MALLEY: I recently had a case which turned out eventually to be syphilitic, in which there was an infection by the ordinary micro-organisms. There was a history of the right frontal sinus having been opened, and of redness and tenderness over it, with swelling extending to the outer angle of the eye. A few days afterwards I laid it open, and tried drainage and ordinary treatment, but with no effect. There was no appreciable rise of temperature. In a few days the œdema had extended to the outer angle of the other eye and across the forehead, so that both eyes were closed with œdema. Therefore I laid him open from one malar bone to the other, and found that the walls of the frontal sinus had gone, though only one had been operated upon, and the bone had been replaced by granulation tissue, the latter having also replaced the supra-orbital ridges, and the fronto-malar joint was in a similar condition. After clearing it out thoroughly and dressing the wound, I thought I would have the Wassermann test done. It was positive. Improvement followed soon after the iodide and mercury mixture had been started, and after injection with "606" there was a marvellous clearing up. There may be a syphilitic factor in some of the cases one hears of. The present case seems to have been an ordinary acute osteomyelitis.

Mr. E. D. D. DAVIS: I have seen two cases of osteomyelitis following a radical operation for antral suppuration. In the operation I did, the antrum was vigorously curetted and the patient died of osteomyelitis and meningitis some weeks later, in spite of a second operation. In another case seen by me, curetting of the ethmoid produced osteomyelitis and death. I have only seen one case of osteomyelitis following a frontal sinus operation. The frontal sinus had been attacked on three occasions by a surgeon, and I did a fourth radical operation establishing free drainage into the nose. The patient developed chronic osteomyelitis of the frontal bone and, I believe, died eighteen months later.

Mr. H. J. BANKS DAVIS: It would be interesting to know, in cases of osteomyelitis following the antral operation, whether the operation done was the intranasal one alone or the complete operation. I do not agree with the present tendency to do the intranasal operation—it does not suffice, because often one finds the antrum filled with polypi, which cannot be properly cleared out by operating through the nose only. This does not apply to acute cases, where polypi have not had time to form or the disease to become chronic.

The PRESIDENT: I am strongly of opinion that the antrum should be cleared out by the external operation, and then an opening made through the inner wall for dressing and washing out. I agree with Mr. Banks Davis that septic matter is very liable to be left behind when only the intranasal operation is done.

Mr. CLAYTON FOX: I should like to ask what the patient dies from in these cases of osteomyelitis in connexion with the jaw. The term osteomyelitis was applied a few years ago only to cases in which there was inflammation of the marrow of the bone. It now seems to be used if any part of the maxilla becomes inflamed. The nature of the operation is important. If the radical operation is accompanied by scraping out, there is more likely to be infection. But these cases of osteomyelitis can be separated from those in which there is extensive inflammation of the diploë between the two tables of the skull bones. Osteomyelitis arising from operation on the maxillary sinus is only a matter of infection which may occur even when only a portion of soft tissue is removed. There must be some inflammation after operation on any portion of tissue, and the bone concerned must be infected for the time being, though perhaps not sufficiently to produce general symptoms, such as pyæmia.

Mr. MOLLISON (in reply): I regret to say that the nature of the microorganism is not known. The operation was done late at night; a swab was taken but seems to have been lost. With regard to the amount of bone removed, I took away both outer and inner tables, exposing the dura well on to the forehead almost as high as the upper limit of the vertical scar. I took away bone from the external angular process on one side, by a curved incision made to that on the other side, also the supra-orbital ridges and a portion of the roof of both orbits. I was not convinced I got beyond the disease at the right external angular process. There are two classes of cases of osteomyelitis of the frontal bone. One is typified by this case of mine. The other class contains those in which the disease came on subsequently to the performance of a frontal sinus operation. These classes are to be separated from one another from the point of view of prognosis. I have no doubt that extensive operation at once is the only treatment: it is of no use to do the operation in portions. I have had three fatal cases in which osteomyelitis has come on subsequent to operations on the antrum or frontal sinus. I am sure the initial mistake of not doing enough at first is fatal. A little point of importance in this case was the treatment of the bare edge of the bone: I painted it with pure carbolic acid, in the hope that any organisms left in the wound would thus be prevented from getting into the bone surface exposed. I am interested in hearing Dr. McKenzie say that the bone will be replaced in course of time.

(*May* 4, 1917.)

Case of Carcinoma of Maxillary Sinus, Three and a Third Years after Operation, with no Recurrence.

By W. M. MOLLISON, M.C.

THE patient, E. C., female, aged 50, was shown to the Section in 1914. Original operation, January, 1914; removal of carcinomatous glands, April, 1914. Recently a gland was felt in the submaxillary region, and it was thought to be the seat of recurrence. It was removed in January, 1917, but microscopical examination showed it to be merely inflammatory.

Mr. HARMER: The notes do not state whether this carcinoma was of an epitheliomatous nature or of the columnar-celled variety. If it was an epithelioma it is a remarkable recovery; if columnar-celled there is nothing unusual in the history of the case.

(*May* 4, 1917.)

Skiagram of the Skull of a Patient suffering from Tumour of the Pituitary Body, with Brief Notes of Operation and Result.

By HERBERT TILLEY, F.R.C.S.

J. D. K., MALE, admitted on March 6, 1917. He gave a history of severe headache on the left side of some three and a half years' duration. About the middle of May, 1916, he noticed marked dimness of left eye. August 21, 1916, an ophthalmic surgeon in New York found a "large scotoma (temporal) of left eye. The fundus of the same eye has small arteries and large veins." Mr. Cecil Snell, of Sheffield, saw the patient in October, confirmed the above findings, and found the right eye healthy, but on February 21, 1917, he discovered that the patient had bilateral hemianopia, "the right optic disk is slightly pale, the left one markedly so. There has been no optic neuritis." "He is now quite unable to read." Wassermann reaction negative. No improvement under iodide of potash.

On March 6, 1917, I saw the patient for the first time. When resting, his pulse was 60. Examination of nose revealed no abnormality beyond absence of left middle turbinal, which had been removed last year. I referred him to Dr. Finzi, who provided me with the radiographs exhibited.

March 22: Operation. Moure's lateral rhinotomy on left side; submucous resection of the posterior third of septum, removal of anterior wall and septum of the sphenoidal sinus, followed by removal of postero-superior wall of sinus and portion of tumour. A loose wad of gauze was inserted into sinus and the external wound was sutured. Great care was taken not to wound the easily visible lateral walls of the sinus and yet next morning the right upper and lower eyelids were intensely ecchymosed, but not swollen.

The patient made an excellent recovery, and the pulse, which was 54 on the evening before the operation, rose to from 65 to 72 during the time he was in the nursing home.

April 12: The patient can now read a little without any difficulty.

Remarks.—The exact nature of the tumour was not determined, and the ultimate issue of the operation cannot yet be stated, although there is marked improvement in his pulse-rate and the patient is delighted with the improvement in his sight. One of the main reasons for bringing forward the case is to emphasize the easy access to the sphenoidal sinus regions which was provided by Moure's lateral rhinotomy.

Dr. DAN MCKENZIE: We have not had many opportunities of seeing cavernous sinus thrombosis, but I suggest that in future it will be possible to make a surgical attack on the cavernous sinus by means of this operation. If I have such a case I shall certainly attempt to get at it through the nose, by the route so successfully adopted in this case by Mr. Tilley.

(*May* 4, 1917.)

Skiagrams illustrating Spasmodic Stricture of the Thoracic Œsophagus.

By DAN MCKENZIE, M.D.

THE skiagrams were taken by Dr. Robert Knox.

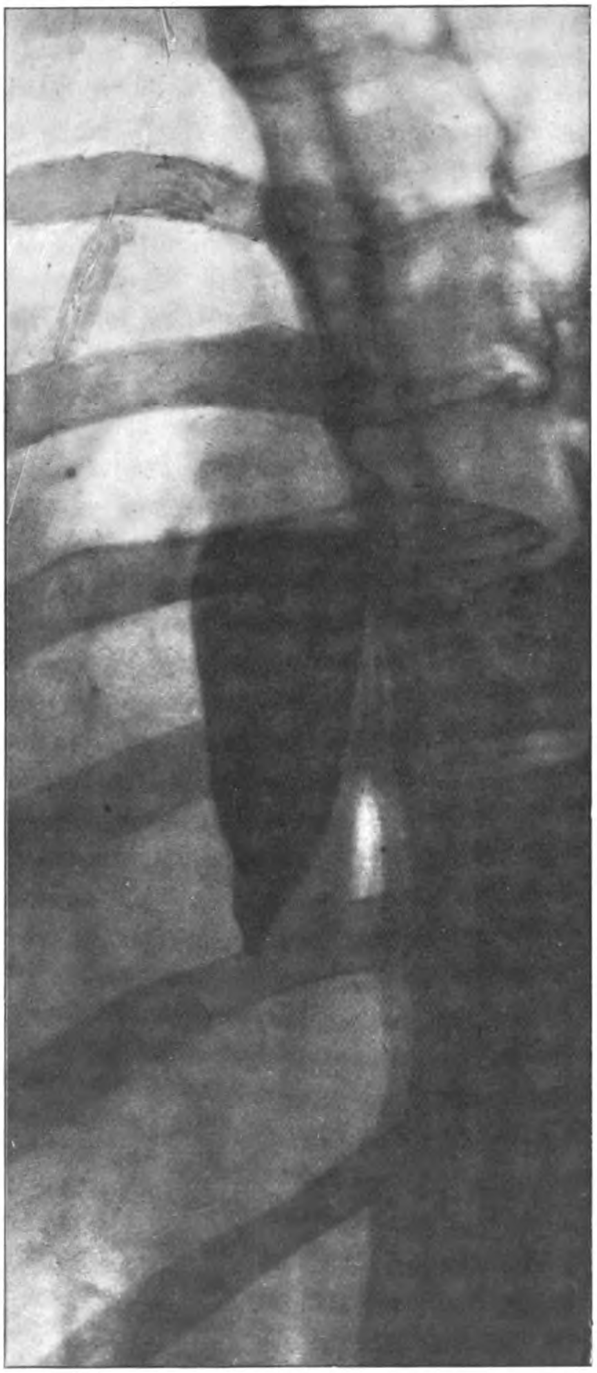
The first (*see* figure), taken during the phase of active spasm, shows the bismuth mixture arrested about the level of the ninth rib. The shadow shows, by the typical pointed lower border, that there is no dilatation above the stricture.

The second shows the thorax in an interval between the attacks, and, the œsophagus being normal, the bismuth mixture is passing without any "hold-up."

The patient is a lady, aged 25. Occasional difficulty in swallowing was first experienced in 1910, and in 1911 the attacks became frequent and pronounced. She married in 1912 and has two children.

When first seen the attacks were very troublesome, coming on at irregular and unexpected times, and varying in degree, although, as a rule, the obstruction was so great as to prevent even soft solids being swallowed, and sometimes liquids were also arrested and obstruction was absolute. The attacks lasted from a few seconds to several days, and the patient was always aware of their onset by feeling a "grip" in her throat. The relaxation of the spasm was also manifested by a feeling of relief. During the intervals between the spasm the patient could eat anything. She was seriously emaciated when first I saw her. Since treatment was begun the attacks have practically ceased; none has lasted more than a few seconds, and these have only occurred once or twice in a month. The treatment consisted in the administration of bromide, and during an attack, of atropin $\frac{1}{150}$ gr. sublingually. The improvement, however, set in immediately after the first X-ray examination.

Mr. DAWSON: I recently had a case which might have been one of spasmodic stricture of the œsophagus—a young woman who for a long time had had difficulty in swallowing. I passed the œsophagoscope, and she said she was much better, and she remained better for a month. Then she returned with a slight recurrence, and the passage of the œsophagoscope relieved her again.



Skiagram taken by Dr. R. Knox during phase of active spasm. Bismuth mixture arrested at level of ninth rib.

(*May* 4, 1917.)

Retro-pharyngeal Abscess; Injury to the Cervical Sympathetic—an Unusual Complication following Operation by the External Route.

By IRWIN MOORE, M.B.

THIS patient, a female, aged 25, was shown at the meeting of this Section on April 7, 1916,[1] two weeks after operation. The abscess was opened by careful dissection along the posterior border of the right sternomastoid, ½ oz. of pus evacuated, the abscess wall, which was found to be much thickened, was curetted, and a drainage tube inserted. Examination of the pus showed tubercle bacilli. The wound healed in six weeks and there has been no recurrence. After the operation the

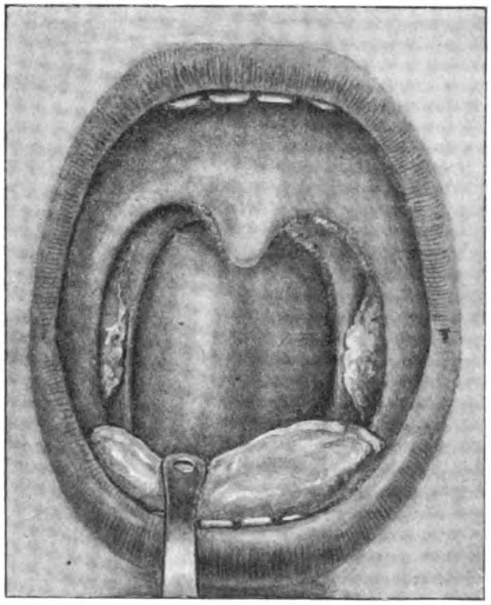


FIG. 1.

Retro-pharyngeal abscess due to breaking down of a tubercular gland—in a female aged 25, operated on by the external route.

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[1] See *Proc. Roy. Soc. Med.*, 1916, ix (Sect. Laryngol.), p. 114.

patient unfortunately suffered from paresis of the right cervical sympathetic manifested by :—

Pseudo-ptosis—slight drooping of the upper lid causing narrowing of the palpebral fissure, due to paralysis of the unstriped muscle fibres of Müller.

Enophthalmos—sunken appearance of the eyeball, which looked smaller than its fellow, and resembled a badly fitting artificial eye.

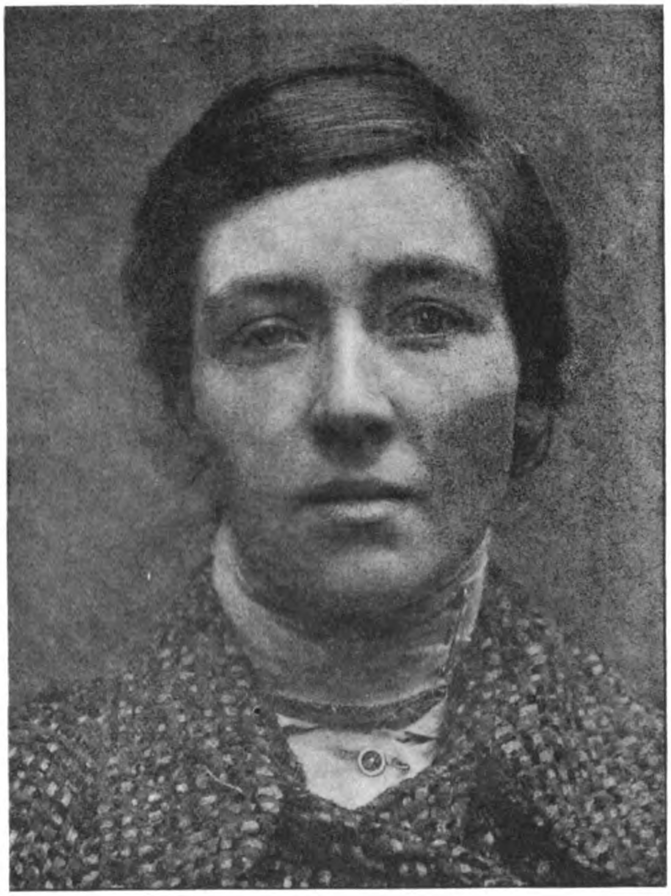

FIG. 2.

Retro-pharyngeal abscess operated on by the external route. Injury to the cervical sympathetic. Shows pseudo-ptosis, enophthalmos, and contracted pupil. Recovery.

Contraction of the pupil with absence of dilatation on shading the eye.

Paresis of the upper portion of the right trapezius muscle was also present—shown by the fact that the patient was unable to shrug her shoulder when pressure was made from above. (Cervical plexus from third and fourth nerves.)

The case is again shown because there was considerable doubt as to whether the paresis would improve, and to draw attention to the possibility of such an occurrence with its accompanying disfigurement, which is ignored in surgical text-books. Treatment by faradism was carried out. Fortunately the symptoms have now cleared up, as may be seen by a comparison with the photograph taken two weeks after operation.

DISCUSSION.

Mr. H. J. BANKS DAVIS: In these cases I am now in the habit of opening through the mouth, though I know it is supposed to be a wrong procedure. Sometimes there is great difficulty by the neck route. I remember operating on a child aged 8 with retro-pharyngeal abscess and secondary œdema of the neck. Landmarks were obliterated, and the incision exposed the anterior border of the sternomastoid instead of the posterior, and in opening the abscess the greatest difficulty was experienced, the neck wound being of enormous depth. I now employ the buccal route with sinus forceps, and I have not seen trouble following. As students, we were taught it was fatal to open through the mouth, though I believe that this is the method in vogue at Great Ormond Street Children's Hospital.

Mr. TILLEY: I uphold what Mr. Banks Davis says and I do not think it is a wrong method. At a large Fever Hospital in London they make no difficulty about opening retro-pharyngeal abscesses from inside the mouth. No anæsthetic is given, and the patient's head is held as if for an examination for adenoids. The surgeon opens the abscess with his index finger and, after evacuating the pus, the patient is returned to bed, and made to lie for two or three days with the head hanging backwards over a pillow, so that no pus can be inhaled into the lower air passages. The cases seem to do very well. The external route should, of course, always be employed when the retro-pharyngeal abscess is due to caries of the cervical spine.

Dr. IRWIN MOORE (in reply): The last two speakers referred to retro-pharyngeal abscesses in children, and there is no doubt that in these cases opening from the mouth is the correct way. In the case I have shown there was a question as to whether it should be done through the mouth or through the neck. This patient's age was 25, and her child had recently been operated upon for tuberculous glands in the neck. I thought this abscess might be found to be tubercular, and therefore it would be better to drain it from the outside to prevent the discharge re-infecting her. The pus from the abscess contained tubercle bacilli. The sac of the abscess was so much thickened that the question of dissecting it out was raised, but I did not attempt it. The wound healed up in six weeks, and the thickening and swelling have now disappeared.

(*May* 4, 1917.)

Syphilitic Disease (Gumma) of the Larynx, treated by Tracheotomy and Galyl Injections, complicated by Arsenical Poisoning; Recovery.

By Irwin Moore, M.B.

This patient, a female, aged 39, was shown at the meeting of the Section on December 3, 1915, and April 7, 1916—a complete history appearing in the *Proceedings*[1] of the latter date. She complained of hoarseness for two months. There was very marked swelling of the left aryepiglottic fold and ventricular band, and the left vocal cord was fixed in the cadaveric position. Perichondritis of the larynx was also present. There was no history of syphilis and the possibility of malignant disease was at first considered.

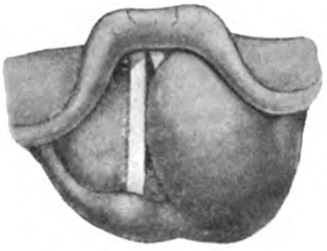

Fig. 1.

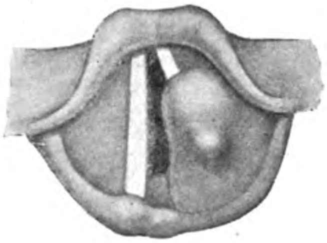

Fig. 2.

Fig. 1.—Gumma of larynx treated by tracheotomy and galyl injections (April 6, 1916).

Fig. 2.—Gumma of larynx treated by galyl injections. Shows improved condition of larynx on May 4, 1917.

On account of progressive stridor, tracheotomy was performed on March 1, 1916. Three days later the Wassermann reaction was found to be positive. An intravenous injection of galyl was given on March 22 and a second on May 2. Following this injection the patient suffered severely for five days from arsenical poisoning, manifested by the following symptoms: Intense headaches and pains all over the body, severe paroxysms of colic, vomiting, watery diarrhœa, muscular tremors, suppression of urine, diminution of vision, and temporary attacks of blindness with dilatation of pupils, paresis of extensor muscles of forearms and dropped wrist, great tenderness on pressure of muscles of forearms. She lay curled up in bed resenting interference, drowsy and at times comatose. As a result of the galyl injections, she soon improved, and the tracheotomy tube was removed on July 7—four months after insertion.

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[1] *Proc. Roy. Soc. Med.*, 1916, ix, pp. 117, 118.

A comparison of the state of the larynx on April 6, 1916, and the present condition (as seen by the drawings exhibited) shows very great improvement. The swelling has considerably diminished, the glottic space is more open. The left vocal cord is now fully exposed, but fixation is still complete. Breathing is quite free and there has been no recurrence of stridor. The patient is greatly improved in health.

Slight discharge still continues from the tracheotomy wound; this is probably caused by infiltration of the thyroid isthmus—caseous nodules having been observed during the tracheotomy.

The special interest of this case lies in the fact that a well-defined, circumscribed gumma of the larynx is uncommon and is generally followed by ulceration, but this did not occur, probably as a result of the galyl treatment.

DISCUSSION.

Dr. JOBSON HORNE: Is it worth while to run the risk of the symptoms that follow this treatment when excellent results are obtained by simply using iodide of potassium and mercury?

The PRESIDENT: Not long ago, I was asked to see a case of severe ulceration of the throat. The patient was under a surgeon in London and a general practitioner in the country. After seeing the case, I wrote and suggested the patient should have 10-gr. doses of iodide of potassium and—what is often omitted, though well known to our forefathers—opium, and another old-fashioned remedy, sarsaparilla. After taking it about two days, the patient came to London to have his first injection of galyl. After that, he continued to take the medicine, and when he came up for another galyl injection, the surgeon said he had never seen such a wonderful result from one injection. Of course the improvement was due to the iodide of potassium *plus* the opium and sarsaparilla. The value of opium in the treatment of severe syphilitic ulceration appears to be somewhat forgotten by the present generation.

Dr. DONELAN: A suppository method of injecting salvarsan has been introduced by Allen and Hanbury. As it takes six suppositories to equal one dose of salvarsan, the treatment can be conveniently varied. In one case where we repeated the series of six, as the patient had been taking arsenic as a corrective of the iodide of potassium, he developed an intense arsenical rash.

These suppositories have yielded excellent effects. I do not think tertiary manifestations can be adequately treated without mercury. There is often a tendency to use iodide of potassium alone.

The PRESIDENT: I have known 1-gr. doses of iodide of potassium act beneficially when larger doses produced unpleasant symptoms.

Dr. IRWIN MOORE (in reply): When I first saw this patient I treated her with potassium iodide and liquor hydrarg. perchlor., but it did not suit her, and she got œdema of the larynx. She had a large circumscribed gumma, causing stridor, for which tracheotomy was necessary. Recently I have tried to get the thickening, which remains, further reduced by again giving potassium iodide and mercury, but patient cannot tolerate potassium iodide except in 2½-gr. doses. At the time I used the galyl there were some samples on the market which were not good in some way—the powder would not dissolve properly—and as a result of my calling attention to it, the agents in London investigated the matter. The instructions supplied by the makers, in their circular, to use a concentrated solution of 10 c.c., is very dangerous, and I have no doubt was the cause of the poisoning in this case. It should not be injected in this strength, but diluted up to at least 20 c.c. with normal saline.

Postscript.—The discharging sinus has now healed as a result of treatment by chromic acid.

(*May* 4, 1917.)

Case for Diagnosis.

By A. L. MACLEOD, M.B.

W. J. H., CLERK, male, aged 57, first seen on February 23, 1917, complaining of hoarseness which had lasted for a year. There was no pain, no cough, no dysphagia. He had had very little treatment. There was some deviation of the septum, both vocal cords were inflamed, and both ventricular bands swollen. After appropriate treatment he improved, but there remained a superficial ulceration of the right vocal cord and part of the anterior portion of the left.

On March 26 he saw Sir StClair Thomson, who wished to be certain that his case was not tubercular. The tuberculosis officer (Leicester) reported on April 14 that he could detect no definite signs of phthisis. Three films from the sputum were examined, but no tubercle bacilli were found. Morning and evening temperatures were taken without showing anything definite.

Mr. H. J. BANKS DAVIS: I think it is either chronic tuberculosis or pachydermia laryngis. It most resembles the latter.

(*May* 4, 1917.)

Case of Nasal Fibroma (of the Right Fossa) with Specimen and Microscopic Section.

By L. H. PEGLER, M.D.

THE patient, a man aged 60, is exhibited one month after removal of the growth by forceps and snare intranasally; the stump being left for the present to show its place of origin from the lower border and septal aspects of the middle turbinate, and also the firm, non-œdematous character of its tissue. The tumour was visible for some time as a smooth, round body projecting slightly below the right anterior naris; the macroscopic specimen includes this part of the lobulated mass intact, much shrunken by spirit; it was not very vascular, and the bleeding was quite moderate. The microscopic section shows the fibrous character of the tumour and especially the abundance of the glandular element. A further report will be supplied later. Few of these nasal fibromata have been shown here, perhaps not one since Dr. Jobson Horne's case in December, 1896.

DISCUSSION.

Dr. JOBSON HORNE: As Dr. Pegler has referred to what I did at the end of the last century, it is only right to explain that, in the light of recent work done by Dr. Pegler, this case would have been labelled "bleeding polypus." It contained more angiomatous than fibrous tissue, and the symptoms were those of bleeding polypus. Therefore, while I was one of the first to show bleeding polypus before this Section, Dr. Pegler is probably the first to show a pure nasal fibroma.

Dr. PEGLER (in reply): There are two points of interest. Anyone examining the scar or stump may gain some information from it. The stump which remains, though it has not been touched since the first operation, is different from that which one finds after operating on fibro-angioma. This will be seen on comparing my case with Mr. Dawson's. One notes its redness and firmness and I may add—that it has not altered since the third or fourth day after the operation. It was essentially a dry, non-vascular growth. What Dr. McKenzie saw and took for vessels are cross-sections of the muciparous ducts. Where there are ducts there must be glands, and another part of the section shows them. The other large spaces are fissures or intrusions of epithelium such as one finds in many nasal growths, especially of the turbinals. They are lined with epithelium and very abundant. Mr. Shattock found these specimens so interesting that he furnished me with a special report, which I shall publish in the *Proceedings* later.

(*May* 4, 1917.)

Case of Aphonia.

By G. C. CATHCART, M.D.

PATIENT, a female, aged 25, was under the care of Dr. Bryan from January, 1914, till the end of July of the same year, and was treated for general weakness, and during April and May for nervous breakdown, laryngitis, and aphonia (one week).

In January, 1915, she again developed laryngitis and aphonia, and was treated in the usual way for six or seven weeks. She was sent to the London Throat Hospital in March. I applied electricity, and her voice lasted till the end of May. She then lost it for a week, but it resumed its normal condition during a Zeppelin raid on the night of June 4.

At the end of March, 1916, her voice had again disappeared. Dr. Bryan applied electricity nearly every night until the end of November, when he made an appointment with me to see her. She was examined by the X-rays for tuberculosis with a negative result. I then applied electricity, and her voice lasted for ten days; after that Dr. Bryan applied electricity, which had no effect. He then sent her to me and I made another application of electricity, with the result that the voice resumed its normal condition. She went to Eastbourne for a month and spent three weeks in London.

In 1917 she obtained work at the War Office, and in another few days she again lost her voice. Between February and the end of March I treated her with the faradic current three times, but her voice only lasted for a few days after each application. The following are the results of last week's treatment by electricity to date (April, 1917): First night, voice lasted three hours, normal condition; second night, voice lasted one and three-quarter hours, normal condition; third night, voice lasted two and a half hours, normal condition; fourth and fifth nights, voice normal at bedtime but failed by morning; sixth night, voice lasted half an hour.

I should be glad to receive suggestions for treatment.

Mr. H. D. BANKS DAVIS: It is a case of functional aphonia, the bowing of the cords being typical.

Section of Medicine.

President—Colonel A. E. GARROD, A.M.S., F.R.S.

(*November* 28, 1916.)

(Chairman—Dr. F. PARKES WEBER.)

Six Cases of Œsophagectasia.

By H. BATTY SHAW, M.D., and A. W. WOO.

PROBABLY most museums of pathological anatomy contain specimens showing dilatation of the œsophagus, which involves the greater part of the tube, and is not due to the existence of a pouch. But though the condition is well known to the pathological anatomist, until recent years the clinician has been at a loss how to detect it, and has generally only discovered it at the post-mortem examination. The advent of the use of X-rays and bismuth meals, and of the œsophagoscope has rendered it possible for this condition to be demonstrated before death. Dr. F. Parkes Weber is the first observer of recent years to publish a case of this kind which was completely diagnosed before death.[1] Major A F. Hurst has more lately described a case discovered before death by means of X-rays, and has used the term "Achalasia of the Cardia"—perferring this term to that of "Cardiospasm."[2]

We have met with five cases, three of which were fatal, and we add a sixth which came under the care of Dr. Sidney Martin in 1892. With his permission we publish the notes of his case, because it presented similarly baffling symptoms at the bedside.

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[1] *Proc. Roy. Soc. Med.*, 1914, vii (Clin. Sect.), p. 147.

[2] *Proc. Roy. Soc. Med.*, 1915, viii (Clin. Sect.), p. 22.

Case I.—E. L., governess, aged 35, was admitted into University College Hospital under Dr. Martin's care, on September 17, 1892, and died on October 22, in the same year. She was admitted because she had had attacks of great difficulty in breathing for about six weeks. Her story was that she had really been ailing for a little over two years, and her illness had begun whilst abroad, with pain in the upper abdomen, accompanied by vomiting, which relieved the pain. There was no hæmatemesis, and she was treated, she said, for "congestion of the stomach." Similar attacks occurred periodically during the ensuing year; but in October, 1891, the pain became persistent, vomiting again giving her relief. These symptoms became intensified until six weeks before admission, when a new symptom developed —namely, attacks of dyspnœa which came on night and day, especially at night and on lying down: the attack would last about half an hour, and, as above stated, it was this symptom which caused her to seek admission. With regard to the pain and vomiting, the latter was lost altogether and the pain was much reduced if her diet consisted only of milk.

Physical Examination.—The patient was a spare woman, and she showed marked inspiratory stridor on occasion, especially after exertion. There was frequent cough, sometimes "brassy" in character: the expectoration was mucoid and watery. The heart and lungs were found to be normal, and repeated examination of the larynx failed to show any abnormality. She had great difficulty in taking solid food: her sleep was disturbed by a cough, and whilst in hospital this grew worse, her temperature rose a little, and she developed dullness at the right base behind. During the night of October 14 she had a very severe attack of dyspnœa, and stridor of an inspiratory type was again noticed. The use of amyl-nitrite and of morphia failed to give relief, whereas chloroform was effective. She did not become blue during the attack.

The cough persisted and the sputum became muco-purulent. On the evening of October 20 the epigastric pain became very severe and a return of her dyspnœa took place. The stridor was mainly inspiratory, but also expiratory. The patient became very livid, and chloroform, pushed to deep anæsthesia, gave no relief to her breathlessness. She then became unconscious (after recovery from the chloroform anæsthesia) and remained so for forty hours until her death; only on one or two brief occasions was there any slight return to consciousness; during this period the pulse failed occasionally, and the veins of the neck became very turgid. During the forty hours there were many attacks of dyspnœa, one or two of which were very severe; in the intervals the breathing was quiet, and the patient's colour was good. Finally the pulse failed, and death from exhaustion ensued. The vomiting *seemed* to be a true vomiting and not a mere regurgitation of food, and took place some time after taking food. On one occasion only had it been noticed that food taken some hours before was returned unaltered. Nothing abnormal was found in the larynx on repeated examination. *Vomiting was usually brought on by an attack of coughing.*

Post-mortem Examination.—The lungs appeared emphysematous. The right lung was adherent by old adhesions at the apex, the lower part showed recent adhesions, and there was a small pleural effusion at the right base. There were patches of broncho-pneumonia in the lower lobe; the left lung was congested in the lower lobe. The heart was normal, but a soft cystic swelling bulged into the back of the pericardial space. On raising the right lung a sausage-shaped tumour was seen lying between the spinal column behind and the trachea and pericardium in front. It bulged into the right chest, and proved to be the œsophagus greatly dilated; it was filled with undigested food, and no stricture could be made out. *The finger could be passed through the cardiac opening of the stomach into the œsophagus, and no resistance was met with in doing this.* The trachea showed no constriction, but a submucous extravasation of blood was seen on the posterior surface near the bifurcation; the cartilages appeared to be a little softened, as though from pressure; the brain, heart, kidneys and liver were normal.

Report on the Œsophagus by Mr. T. W. P. Lawrence.—An œsophagus measuring 24 cm. in length, with the cardiac end of the stomach. At the upper end the internal circumference measures 4·5 cm., at the cardia 5 cm. Between these points, involving the whole œsophagus, there is a fusiform dilatation, which reaches its maximum width at about an inch below the middle, where the internal circumference is 13 cm. The wall of the tube is slightly increased in thickness at the lower end (about 4 mm.) and becomes gradually somewhat thinner towards the upper part. In the main part of the dilatation the rugæ are smoothed out, but are still present at the upper and lower portions of the tube, and in the latter situation the mucous membrane is swollen or altered in appearance so as to resemble somewhat the mammillated mucous membrane of chronic gastritis, and in many places it shows with a lens a finely papillary surface. The epithelium in the most dilated part of the tube is irregularly thickened, and in places destroyed, leaving small areas of ulceration in which the muscular coat is laid bare. No ulcers or cicatrices are present in the lower part of the œsophagus, or cardiac end of the stomach. The submucosa appears to be everywhere loose and free from induration. At the lower end of the specimen on its external aspect, there is a small group of slightly enlarged lymphatic glands, one of which contains caseous foci; these are connected with the stomach rather than with the œsophagus, though at one spot they slightly overlap the extreme lower end of the latter.

Microscopical Examination.—(*a*) Chronic catarrhal inflammation: This is most marked at the lower part of the œsophagus. The epithelium is thickened, shows a tendency to surface desquamation, and the papillæ are increased in size, forming bead-like projections above the general surface. There is some induration of the areolar layer between the epithelium and the muscularis mucosa, with leucocytic exudation. The submucous tissue and the areolar tissue between the circular and longitudinal muscle layers are also in places slightly indurated. In the smooth area of the more dilated part of the œsophagus these changes are less marked, and the papillary hypertrophy is absent. (*b*) Muscular hypertrophy: Judging from the thickness of the circular muscle fibres, this appears to be slightly hypertrophied in the lower half of the œsophagus. (*c*) Muscular atrophy: Many of the bundles in the circular layer of muscle fibres are very slender and obviously atrophic. This condition is fairly uniform in the more dilated part of the tube; but only occurs in localized patches at the lower end. (*d*) Definite staining for fat with Scharlach R. and Sudan III is not obtainable.

Case II.—J. H., an accountant, aged 55, was admitted to University College Hospital on May 21, 1914. He complained of the following symptoms: (*a*) general weakness for a month, much worse one week; (*b*) difficulty in keeping his food down, particularly solid food, on and off for eighteen years; it had become much worse in the last six weeks, when his food had to be returned immediately after taking it; (*c*) pain in the chest on and off, not related to the actual taking of food, most marked during the preceding month, and much worse the last week; and (*d*) during the last two weeks he had developed shortness of breath and cough. His symptoms began eighteen years previously, when after having had dinner he had a fit of coughing and fell down unconscious. He recovered and felt quite well, but three days later he found he could not swallow properly. He went to Guy's Hospital and was under the care of Mr. Charters Symonds. Thence he was sent to St. Bartholomew's Hospital and remembered he was "fed with a tube." He had had pneumonia at the age of 17, typhoid fever at the age of 23, and influenza and bronchitis at the age of 51. There was no history of syphilitic infection, nor was there any history of a similar sort of "dyspepsia" in his family. He was moderate in the consumption of alcohol and in the use of tobacco.

Physical Examination.—On admission he was found to be wasted, was rather short of breath, had some pain in the upper abdomen which was bad enough to disturb his sleep very much, and he had some cough and brought up grey expectoration. He was tender in the upper part of the abdomen, to the left of the middle line. There were no abnormal physical signs in the heart, the blood-pressure registered 94 to 116 mm., the pulse was regular, 100 to a minute, and the temperature was 99° F. The lungs were emphysematous and rhonchi were heard on both sides.

X-Ray Examination by Mr. R. Higham Cooper (*May* 25, 1914).—A bismuth emulsion appeared to pass straight into the stomach, and there was no sign of an œsophageal pouch. The plate, however, showed a considerable increase in width of the shadow usually seen at the base of the heart.

An œsophageal bougie, the size of the little finger, was passed by Mr. Herbert Tilley without any difficulty, and *apparently* into the stomach, and the patient said he had felt "relieved by this, as if something had been pushed on." A rather small-bore œsophageal tube was then passed for 21 in. This caused immediate discomfort and retching, and when withdrawn a piece of carrot, eaten twenty-four hours before and practically unaltered, was found in the eye of the tube. Œsophagoscopy showed a dilated œsophagus, the walls of which were folded, presenting depressions and crevices which caused confusion when an attempt was made to pass a bougie through the œsophagoscope into the stomach. The attempt to do this failed entirely. Analysis of the vomited matter showed no *free* hydrochloric acid, but some lactic acid. The total acidity was 0·073 HCl grm. per cent., the proteid HCl was 0·036 HCl grm. per cent., and the lactic acid 0·045 HCl grm. per cent. There was a trace of albumose present and there was only a small amount of digestive power (Dr. F. H. Teale). The vomit varied in amount from 1 oz. to as much as 38 oz. Attempts were made by liquid dietary and rectal feeding to maintain the patient's strength, but he wasted rapidly and died on June 1, 1914, in an attack of angina pectoris.

At the post-mortem examination the patient was found to have a dilated œsophagus and calcification of the coronary arteries; beyond this no other abnormality was found.

Report by Mr. Lawrence.—An œsophagus measuring 28 cm. in length, with the cardiac end of the stomach and the bifurcation of the trachea. From above down the œsophagus presents the following peculiarities: (*a*) For 6 cm. as far down as the bifurcation of the trachea a slight cylindrical dilatation and marked hypertrophy. (*b*) For 17 cm. below the bifurcation a large fusiform dilatation with a maximum internal circumference of 16 cm. at a little below its middle; marked hypertrophy of the walls in the upper third of this part, with a maximum thickness of 6 mm. at its highest part, the wall gradually thinning to 2 mm., somewhat below the middle and again increasing at the lower end of the dilatation. (*c*) For 4 cm. below the fusiform dilatation a slight cylindrical dilatation, with marked hypertrophy (7 mm.). (*d*) The lowest 1·5 c.m. of the tube normal. The rugæ are smoothed out in the more dilated portion, and the mucous membrane shows patchy thickenings of the epithelium, which in places has become detached, leaving shallow circular and irregular ulcers. There are no ulcers nor cicatrices in the lower part of the œsophagus or cardiac end of the stomach. No enlarged glands, induration or other changes are present round the lower extremity of the œsophagus.

Microscopical Examination.—(*a*) Chronic catarrhal inflammation: The epithelial layer is narrow generally, owing apparently to desquamation; in the most dilated portion the epithelium is absent in places. Between the rugæ at the lower end the papillæ are hypertrophied, forming small projections on the surface. The areolar tissue between the muscularis mucosæ and the epithelium and the adjacent part of the mucous layer is infiltrated with leucocytes and is slightly indurated. In the lower part of the œsophagus there is some fibrosis of the layer of longitudinal muscle and of the areolar tissue between the two muscle layers. (*b*) There is marked hypertrophy of both muscle layers, except at the most dilated part of the œsophagus. (*c*) There is marked atrophy of the bundles of circular fibres in the region of greater dilatation.

The following deductions have been made by Mr. Lawrence on these two specimens: (1) That the inflammatory changes are simply due to irritation by retained food. (2) That the hypertrophy, even when it extends to the upper part of the tube, must be due to obstruction at or near the lower end. (3) That the atrophy is due to stretching of the walls owing to dilatation by food retention, and that it may be preceded by hypertrophy. (4) That in Dr. Martin's case there never was much hypertrophy, and that therefore hypertrophy is quite a secondary process in these cases: in fact all the changes seem to be secondary.

Case III.—A. B., aged 50, housekeeper, had been anæmic as a young woman, and liable to faint. At the age of 30 she hurt herself by swallowing a rather large fish-bone. She first noticed a trace of dyspepsia at the age of 33, when she began to observe that swallowing effervescing drinks like ginger-beer caused her great discomfort in the chest. Eleven years ago a definite pain developed behind the sternum, which was relieved by bringing up wind. Cold food, solid or liquid, always caused the greatest degree of this pain. Solid foods generally seemed "to stick" at the epigastrium, and caused her to return the food, or at any rate if she made herself sick she was much relieved of the pain; butter and fat foods also seemed to increase this pain; the pain did not necessarily come on as the result of taking food; it was accompanied by a feeling of distension of the abdomen. During the night mouthfuls of food, not very acid, would be brought up, and sometimes be expelled through the nostrils. It was about this same time that she first noticed shortness of breath after taking solid food, and relief came only by her bringing back her food. When seen by one of us at this stage naturally some form of obstruction was feared. She did not, however, seek further advice for eighteen months, and then as she was well nourished, and her symptoms had not intensified since she had kept to a liquid or a very light diet, a tentative diagnosis of dyspepsia was made; her teeth were put in order and a stomachic mixture containing bismuth was prescribed; this latter apparently relieved the slight symptoms that persisted despite the light character of her diet. In the course of time she got tired of the diet, which consisted of milk, custards, bread and milk, and scrambled eggs, and came under the care of Dr. J. C. Williams, who was struck with the persistence of the symptom that food apparently "stuck in the chest," and suggested the use of a bismuth meal and X-ray examination. This was carried out by Mr. R. Higham Cooper on September 30, 1914. He found that "on examination immediately after the meal no shadow of the stomach could be made out. All the bismuth meal appeared to be in the œsophagus, which showed enormous general dilatation, with a small process below and to the left, evidently corresponding to the cardia. Half an hour after the meal small portions of opaque matter were seen ejected from the œsophagus at the end of each forced inspiration. One and a half hours after the meal was taken there was a mass with rounded lower border, visible below and to the left of the umbilicus, evidently representing the greater curvature of the stomach. Above this was a long spindle-shaped mass in the position occupied by the ejected particles mentioned in the previous examination. Four and a half hours after the meal was taken the shadows in the stomach had disappeared; but that in the œsophagus was practically unchanged. Further examination could not be made, as the patient became sick and faint. The condition appeared to be one of almost complete obstruction of the cardia, with consequent dilatation of the œsophagus. On pressure being applied to the œsophagus by inspiratory movement, the fluid parts of the meal seemed to be squeezed through the cardiac orifice. . . . ."

This patient is alive still, is very well nourished, and so long as she adheres to a dietary such as has been indicated above, she is free from all but the slightest symptoms. Owing to the absence of Mr. Cooper in France we are unable to reproduce his pictures, and Dr. Stanley Melville has radiographed her again, and reports as follows: "Opaque porridge passed without difficulty as far as the lower end of the œsophagus. At this point further quantities of the meal were seen to collect above the constriction, the œsophagus dilating to accommodate the food. There was some tendency for the food to regurgitate, and what appeared to be reverse peristaltic waves were noted in the œsophagus. The appearance of the œsophagus at the conclusion of the meal bore the customary shape of cardiospasm, the sharp 'sickle-shaped' outline to the right of the cardiac shadow being well marked. In this case, the usual thin line of food as it slowly passed the obstruction was not very evident, but small quantities of the meal were seen at intervals to enter the stomach."

Case IV.—F. P., aged 24, accountant's secretary, came under the care of Dr. J. A. Belcher, at the beginning of this year, for cough and hæmoptysis, which he found was due to pulmonary tuberculosis. She had also noticed for the previous three years that when she took solid food it appeared to stick in her chest behind the breast-bone, and on occasions the food would come up, apparently little altered. Liquid food did not cause any trouble; sometimes the food brought up had been taken a day or so before. She had lost nearly 2 st. in weigh in three years, and was short of breath, two symptoms, however, as easily attributable to her lung condition as to that of the œsophagus. With careful dieting the regurgitation of the food became much less frequent, and if she ate slowly and thoroughly masticated her food she could retain fish, chicken, and even meat, though this was not always the case. It was distinctly noticed that sometimes she had a difficulty in retaining food, whereas at others, on the same diet, she had none. Dr. Stanley Melville carried out an X-ray examination on March 17, 1916, using a bismuth meal, and reports as follows: "The opaque meal of the consistency of porridge passed without delay or obstruction until the lower limit of the œsophagus was reached. At this point the food was arrested, further quantities of the meal accumulating at the expense of the œsophagus, which continued to dilate until a large mass, with a well defined and characteristic curve to the right, was seen. This was distinguishable from the right border of the heart. After an interval of about ten minutes, a thin, somewhat long, and sinuous streak was seen to be entering the stomach. There was very marked delay in the passage of the food into the stomach, and at the end of an hour only a portion of the meal had passed the constriction."

On April 7, 1916, the patient was again placed under X-ray examination. Considerable improvement was observed in the transit of the bismuth meal; for at the end of fifteen minutes the greater part of the bismuth had reached the stomach. Dr. Dundas Grant was able to carry out an œsophagoscopic examination and to demonstrate the folds and recesses met with in the walls of what was evidently a dilated œsophagus.

The radiographic study of the two last cases was interesting in that besides giving the true diagnosis, an interesting phenomenon was noticed when the patient took a deep breath. A pencil-like shadow of bismuth could be seen, indicating the narrow lower end of the œsophagus and the cardiac orifice of the stomach. This would remain unaltered for some time, and so far as a radioscopic examination was concerned no food was taken into the stomach, showing the obstruction was probably complete, even for such a weighty salt as the one of bismuth used. However, this obstruction could be overcome in both cases when the patient took a deep breath or coughed; for then a fainter shadow of the bismuth meal could be seen, indicating that some bismuth escaped on such occasions into the stomach. The obstruction was not absolute.

Case V.—Through the courtesy of Dr. Arthur Latham and Mr. G. F. Darwall-Smith we are able to publish the details of a case which came under the observation of one of us (A. W. Woo) at the General Lying-in Hospital, York Koad, S.E. The patient subsequently died at St. George's Hospital. Mrs. E. T., aged 33, the mother of three children, was admitted to the hospital on January 28, 1915. She was thirty-two weeks pregnant; as she had frequent vomiting, which could not be controlled, she was admitted as a case of "pernicious vomiting of pregnancy." The following points in the history of the case were elicited, part being obtained from the husband, because the patient herself had developed defective memory. It was found that she had never had any serious illness before, but that she had always to swallow slowly and that the difficulty in getting the food down had for the last ten years been increased, so that even slow swallowing did not obviate it. During these ten years the food would occasionally be actually brought back as if she had vomited it, and there was an accompanying sensation of nausea. This return of food, it was found on close inquiry, only followed immediately on the ingestion of food; that is to say, it did not occur during periods of fasting. In November, 1914, the patient had a very severe attack of coughing, which seemed to intensify the habit of bringing up her food after swallowing it, so much so that from this date until her admission to hospital, it was a constant feature, and for four days before admission she had been quite unable to retain any food given by the mouth. The attack of coughing which began this phase of severe vomiting was not an isolated attack. She was liable to similar attacks, and even had had attacks of " asthma." When she swallowed food she noticed that it "seemed to stick" at a point referred to the lower end of the sternum.

The clinical study of this case belongs to the patient's stay under Mr. Darwall-Smith's care at the General Lying-in Hospital, and under Dr. Arthur Latham's care at St. George's Hospital. On admission to the former hospital she was found to have a distressed facial aspect, to be emaciated, was suffering from bronchitis and was slightly deaf (the deafness having come on two days previously): the temperature was sub-normal and the pulse-rate 120 per minute throughout her stay. No abnormality was found in the urine. The bowels were constipated; there were some scars on the right side of the neck suggesting former glandular disease; her nervous symptoms were such as to suggest neurasthenia. Various remedies were tried to check the vomiting, and the simplest of dietaries, consisting of albumen water or peptonized or "citrated" milk in small quantities, was adopted. Despite these efforts the food was rejected after being swallowed, very often being associated with a bout of coughing, or the bringing-up of phlegm from the pharynx. Thinking over the case at the present date, it seems to us very possible that the very act of coughing, or straining to bring up phelgm, was responsible for the rejection of food, and also probable that the mere taking of the food provoked the cough. On February 6, 1915, that is nine days after admission, it was considered desirable that labour should be artificially induced, and this was carried out, the child being alive and weighing 77½ oz. The effect upon the vomiting was nil. The bronchitis rapidly got less under treatment with expectorants, &c. On February 22, other symptoms were suddenly added. The deafness increased, the patient became dizzy, her memory was more impaired, and she became somewhat drowsy and delirious. Her sight began to fail, so that though she could appreciate light, she was unable to recognize the faces of those about her. Ophthalmoscopic examination showed the presence of swelling of the disks and of retinal hæmorrhages. Nystagmus was present and marked; the knee-jerks could not be obtained. On February 25 an attempt was made to give relief by washing out the stomach. The stomach-tube passed in easily for a distance of 15 in., measured from the incisor teeth; but it was impossible to pass it beyond that distance. The passage of the tube caused the patient to retch, and actually to eject food she had swallowed; the return of the food was not through the tube, but outside it, and escaped by the mouth and nostrils. The patient's condition had become very grave, and it was considered desirable to transfer her to St. George's Hospital. This took place on February 27, 1915. When admitted she was not unconscious, but drowsy, she was wasted and pale, and had a little bronchitis; temperature 96° F., pulse 86, respiration 20. The pupils were found to be equal and they reacted to light; bilateral optic neuritis and flame-shaped retinal hæmorrhages were present. The knee-jerks were diminished, and the calves were somewhat tender. A faint trace of albumin now appeared in the urine. The symptoms did not improve and the patient died on February 28, 1915.

We are indebted to Dr. R. Salusbury Trevor for the following post-mortem report: "There was well marked lordosis and old scars on the right side of the neck, the lungs were œdematous and collapsed at their bases; no indications of tuberculosis were seen, but there was much bronchitis. The heart weighed 6 oz., showing typical brown atrophy; the mitral valve was thickened, but competent; the aorta was small, but natural; there was no atheroma; small petechial hæmorrhages were found at the base of the right ventricle; the heart was not a 'renal' heart. Nothing abnormal was found in the abdomen; the right kidney weighed 4 oz., and looked healthy, except for slight injection of the pelvic blood-vessels; the left kidney weighed 2 oz., it was much furrowed as if by old infarcts; but on section they had not that character, the cortex being normal in colour and plentiful. Alimentary canal: The only point of interest was the condition of the œsophagus, which showed fusiform dilatation from the cricoid cartilage to the cardia, suggesting a second stomach. The length was 10 in., the maximum width 4½ in.; it contained about a pint of milk. The muscle was hypertrophied; the mucosa was ulcerated, small white epithelial islands being left in patches on an ulcerated surface. The stomach was small and catarrhal. The uterus was enlarged, and showed on the fundus and posterior walls a shaggy mass of placental tissue and clot; there was no endometritis. The brain showed no abnormality. Flame-shaped hæmorrhages and optic neuritis were demonstrated in the right fundus (confirmed microscopically). There was well marked lordosis of the spine. The right vagus was dissected out and appeared to be normal.

"*Microscopical Examination.*—This showed marked inflammation of the epithelial lining of the œsophagus, and there was small-celled infiltration between the muscle fibres. The circular muscular coat was much fibrosed, and in portions of the œsophageal wall which corresponded to dark rings, seen by naked eye on the mucosa, the blood-vessels were greatly dilated, even producing an angiomatous appearance. The furrows noticed in the left kidney corresponded to areas of fibrosis which appeared to originate around the blood vessels."

Case VI.—Mrs. R. T., aged 51, was admitted to University College Hospital on May 29, 1916, for pain after taking food, vomiting and wasting. She had been quite well up to four years before admission, when she began to have attacks of chest pain and vomiting. The attacks, when severe, lasted about two weeks, but at the beginning, each attack was followed by an interval of about two months, during which the patient was quite well. Gradually the attacks became much more frequent, and for the last five months, the interval between the attacks was only about three weeks. The pain was felt behind the middle of the chest and in the upper part of the stomach; it was dull in character and came on about twenty minutes after a meal, particularly, but not exclusively, if the meal was a solid one. In another ten minutes, vomiting would occur and then the pain was relieved: the site of the pain was constant and it did not radiate in any direction. Vomiting was a constant sequel to the pain; the vomited matter varied in quantity, the severe attacks amounting to over one pint, the vomiting was easy and the vomited matter was free from blood. There was no flatulence. No history of any antecedent illness was obtained. On admission, the patient was found to be wasted (5 st. 8 lb. 11 oz.), and anæmic. She was somewhat tender on pressure in the epigastrium and the right rectus was somewhat rigid; on distending the stomach with carbon dioxide, it was found to be dropped, the brown margin reaching well below the umbilicus. She was given a fish diet on admission and seemed to be able to swallow it comfortably. Examination of the blood showed secondary anæmia; the examination of a test meal obtained on June 1, showed no free hydrochloric acid, although the total acidity was 0·219 grm. HCl per cent., consisting of protein hydrochloric acid 0·1095 per cent., and of lactic acid. Albumose was present and the digestive power was 30 per cent. (Dr. F. H. Teale). During her stay in the ward, the patient had irregular fever, reaching on occasions as much as 102° F. Gradually pain and vomiting recurred, pulse and respiration ratio increased in frequency, and death took place on June 30. A radioscopic study of a bismuth meal had been made, but so far as could be seen, there was nothing pointing to delay in the passage of food along the stomach or intestine.

Report by Mr. Lawrence. — "The œsophagus is 23·5 cm. in length. Its upper and cardiac orifices are of normal size; between these the tube is dilated throughout, its internal measurements being: At 2 cm. below cricoid, 6 cm. circumference; at 5 cm. below cricoid, 8 cm. circumference; at 11 cm. below cricoid, 7·5 cm. circumference; at 17 cm. below cricoid, 13·5 cm. circumference. Longitudinal rugæ are generally absent from the mucous membrane, except at the upper parts; in the middle third there are scattered superficial erosions of small size; in the lower third the mucous membrane is thickened and opaque and the submucous tissue indurated. At the lower end, just above the cardia, is an oval ulcer about 1 in. in length, which has part of its edge thickened, indurated and overhanging. The muscle of the upper half of the œsophagus is not appreciably hypertrophied; in the lower half it is distinctly but slightly hypertrophied, except at and for a short distance above the cardiac orifice, where it is normal. The lower tracheal and bronchial glands are much enlarged and caseous, and are adherent to the œsophagus in places. Just above the level of the aorta a softened gland has perforated the œsophagus by an aperture measuring 2 mm., and lower down, at about the middle of the œsophagus, is a larger ulcerated aperture (about 1 cm. in diameter)."

REMARKS.

(1) It certainly looks as if this condition is not so very rare.

(2) The symptomatology is very variable. Dr. Martin's patient (Case VI) died comatose, and had symptoms of dyspnœa, which to a certain extent simulated asthma. The second patient also had shortness of breath, and at any rate at the beginning of his illness he had lost consciousness. Our third and fourth cases had some similitudes to cases of dyspepsia, one to ordinary acid flatulent dyspepsia, and the other to the dyspepsia of pulmonary tuberculosis. The fifth case simulated the toxic vomiting of pregnancy, and also had a history of attacks of cough and of asthma. The sixth case simulated carcinoma of the stomach.

(3) *Causation.*—Such cases in the past have been frequently referred to as examples of cardiospasm, by which is meant that quite independent of any organic lesion spasm occurs in the circular muscular fibres round the cardiac orifice of the stomach (cardiospasm). The obstruction caused by this phenomenon leads to dilatation of the œsophagus and to a variable amount of hypertrophy of the muscle of the tube, food being retained in the œsophagus, irritating its walls, leading to chronic inflammation, and assisting in bringing about dilatation. This might be looked upon as a sort of *positive* cardiospasm, but, unfortunately, there is no proof histologically that there is hypertrophy of the muscles of the cardia such as might be expected if spasm had occurred. Dr. H. D. Rolleston[1] has advanced the view that possibly the action of the longitudinal fibres is at fault, in that they do not help to dilate the cardia at the moment when the œsophagus is ready to propel food into the stomach, so that the circular fibres remain unopposed in action, producing, as it were, a *negative* cardiospasm. This view has been adopted very largely by Major Hurst, and he has introduced the term "achalasia of the cardia" to describe these cases, by which he means that when the peristaltic wave passing along the œsophagus reaches the cardia the relaxation which should occur then does not take place. He does not, however, commit himself to any explanation why this relaxation does not take place, other than the one suggested by Dr. Rolleston, who, as we have seen, hypothecates faulty action of the longitudinal muscular fibres.

Dr. F. Parkes Weber has put forward the ingenious suggestion that the neuro-muscular inco-ordination causing the faulty action of the longitudinal muscular fibres was akin to heart block, and, if this were the case, it is easy to see that the block might not only be due to structural changes in the longitudinal muscle fibres, but to functional ones which would not reveal histological change.

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[1] *Trans. Path. Soc. Lond.*, 1896, xlvii, p. 37.

Accepting Dr. Rolleston's view, it is easy to see that we need not necessarily in each case find that the post-mortem evidence of muscular hypertrophy is identical. Major Hurst asserts that in none of these cases is hypertrophy of the cardiac sphincter observed after death, but hypertrophy of the œsophagus as a whole was met with in our third case, except at the most dilated part, Mr. Lawrence finding hypertrophy in both muscle layers, and hypertrophy was seen in the fifth case by Dr. Salusbury Trevor. In our first case Mr. Lawrence found slight hypertrophy of the circular muscular fibres in the lower half of the œsophagus. From these facts and from accounts given by others it is clear that in some cases hypertrophy is the rule; in others atrophy is the more marked feature, whereas in others, again, there is hypertrophy of one part of the muscle layer and atrophy of another. So far as a consideration of the literature shows, the œsophagus in these cases in no way simulates the condition of the stomach wall in the condition met with in hypertrophy of the pylorus in children, where *all* the muscular coat of the stomach is hypertrophied, and that near the pylorus especially.

A second theory may be advanced for the explanation of this condition. The researches of Braune and of von Goubaroff have shown that a valvular mechanism may exist at the cardia, owing to the fact that when the œsophagus pierces the diaphragm it turns somewhat abruptly to the left side to open into the stomach, and it is probable that when the stomach is distended this bend is increased to such an extent as to obstruct the return of the contents of the stomach into the œsophagus. Obviously in such a condition there may be an obstruction to the passage of food from the œsophagus into the stomach. We think that this would provide an explanation for the occurrence of these cases, and we think that after childhood and early youth has passed, this valvular obstruction may begin to be operative to the extent of producing symptoms for the first time in the individual's life. This is in harmony with the well-known clinical fact that visceroptosis does not, as a rule, produce symptoms until early adult life is reached. In every one of the cases which we have recorded the symptoms were absent in childhood and youth, and first were noticed at the ages of 33, 37, 33, 21, 23, and 47. Another fact which supports this theory is that occasionally during life the obstruction at the cardia *disappears*, the bismuth meal at one time meeting with obstruction, and at another time apparently passing on without any delay. This would explain why, in our second case, Mr. R. Higham Cooper found that the bismuth meal passed straight into the stomach, and yet at the post-mortem examination the classical condition of œsophagectasia was present. Further, in Case IV, Dr. Stanley Melville was able to prove by bismuth meals that there was obstruction on March 17 of this year, and that on April 7 it had quite passed away; the disappearance of the obstruction in this case is also confirmed by the fact that the patient can at the present time swallow solid food without difficulty, and has no symptoms whatever, although, as we have seen, she has persistent œsophagectasia. We feel, therefore, that there is a good deal to be said for this mechanical kinking at the cardia as an explanation of the development of the dilatation of the œsophagus in these cases, a theory which does away with the need to postulate "spasm" of circular or longitudinal muscular fibres, for which it is impossible to find an explanation.

(4) A few words remain to be said with regard to the symptomatology and other features of these cases.

(*a*) They must not be confused with cases of hysterical spasm of the œsophagus, in which neither food nor bougie can be passed. Hysterical manifestations were remarkable by their absence in our cases. It will be noted that five out of the six patients were women.

(*b*) That death may occur directly or indirectly about the age of 30, as in two of these cases, or may be postponed to later life, when death may occur from some quite independent cause, angina pectoris in our second case, at the age of 55, and at a still more advanced age from pneumonia in Sir Samuel Wilks's case.[1]

(*c*) The outstanding features which should attract the physician's attention to these cases are as follows:—

When food does not seem to pass down the œsophagus properly, it "sticks" behind the breast-bone, and may even cause pain in the epigastrium; *further, this has been noticed, frequently for a few or many years.* Relief is obtained by making the food come back, the patient securing this by tickling the fauces, attempting the act of vomiting, or by coughing, or by taking a deep breath. It will be found that the taking of a meal is followed by a feeling of difficulty of breathing, actually described by some patients as a feeling of stifling or of asthma, which is only relieved by again bringing up the food. In some cases a condition of persistent cough is provoked by taking a meal, as if the dilatation of the œsophagus irritated the lung, and caused a reflex cough, the combination of cough with attacks of respiratory embarrassment giving rise in these cases to the opinion that the patient is suffering from true bronchial asthma. When studying the transit of a bismuth meal by means of X-rays in cases of so-called "dyspepsia," it is very necessary to observe the shadow in the œsophagus as well as in the stomach and intestine; two at least of the above cases were missed from want of this precaution.

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[1] *Trans. Path. Soc. Lond.*, 1866, xvii, p. 138.

These patients soon learn that the best way to obviate symptoms is to masticate very thoroughly, and to spend some extra time over their meals, avoiding all "bolting." If this plan fails, they generally betake themselves to liquid diet, with which they can deal comfortably.

(*d*) We are entirely at a loss to explain why Dr. Martin's patient died unconscious, having been in that condition for something like forty hours; possibly it was due to acidosis. That it was not an exceptional feature is shown by the fact that our second patient lost consciousness at the onset of the malady, and our third patient was, when a young woman, liable to faint; this may, however, have been simply due to "anæmia," from which she suffered as a girl, for she has not had such a symptom during recent years. Our fifth patient also showed loss of consciousness; but there were other possible causes for it besides acidosis; there can be little doubt that her death was really due either to the toxic condition which produces pernicious vomiting in pregnancy, or it was due to uræmia, or to both.

(*e*) In conclusion, we would call attention to the extreme ease, in the absence of a careful history, of confusing these cases with dyspepsia, and even with bronchitis and asthma, for in none of them, except the fourth, did the patient volunteer the information which led us to suspect the condition which we have described.

We do not feel any hesitation in using the term "Œsophagectasia" for these cases. The name describes what is an obvious fact, and does not commit us to any of the various theories which have been advanced and as yet not proved.

DISCUSSION.

Professor S. G. SHATTOCK: None would deny that dilatation of the œsophagus *may* result from a cardiac kink, but such a condition would, speaking pathologically, have little interest—not more than the hydronephrosis that results from a kink of the ureter. The condition in question, however, has a pathogenesis of its own; it is idiopathic. Certain things can be, I think, excluded in its causation, and its ætiology thus indicated by way of exclusion.

(1) That it is not due to vagal palsy is clear from the fact that the muscular wall of the dilated part is not atrophic nor degenerate; it maintains its relative thickness like that of the intestine above the seat of a chronic obstruction.

(2) If the condition of the cardia be compared with that of the pyloric canal in "hypertrophic stenosis," a notable difference at once appears in the thickening of the circular muscular wall of the pyloric canal, which is as invariably found as it is invariably absent at the cardia in cases of dilated œsophagus. The overgrowth of the musculature of the pyloric canal is best explained, perhaps, by regarding it as due to spasm, possibly brought about by a hyperæsthetic state of the mucosa at this spot, whereby it responds abnormally to the mechanical stimulus of the passage of the gastric contents. This difference is one reason for not viewing dilatation of the œsophagus as due to cardiac spasm or hypertonic contraction.

(3) With respect to the theory of kink, the evidence would require that the parts should be displayed *in situ* after death; this has not yet been done. Moreover, a kink of many years' duration would presumably become permanent by a process of "adaptive atrophy"—the process whereby any part becomes organically shortened on the side of relaxation, if kept for any length of time in a distorted position. In the Museum of St. Thomas's Hospital there is an excellent example of dilated œsophagus which is instructive since it is not so widely distended as is the case in Dr. Batty Shaw's specimens. In this the cardiac portion of the stomach is preserved: there is no deviation whatever from the direct line. The parts came from a patient who had suffered for thirteen years from œsophageal obstruction, and who ultimately died of inanition.

(4) As regards a "block" theory, I had considered this possibility in a paper published a few years ago on "Idiopathic Dilatation" of the urinary bladder, and I then came to the conclusion that it did not admit of being applied. If the intestine is divided transversely the nerve impulse ceases to travel across the gap; here there is a "block." But nothing of this kind results under similar circumstances in the œsophagus; the impulse is transmitted across the interval by means of the vagus, and, in the case of the dilated œsophagus, no organic lesion of the vagus such as would result in a block has been demonstrated.

One is thus led to the hypothesis that the dilatation is due to an inco-ordination of the nervous impulses transmitted by the vagus during deglutition, which impulses should normally cause contraction of the tube and an active dilatation of the cardia; if the cardia dilates at all, the dilatation does not synchronize with the contraction of the tube above, and it remains closed, so far as practical purposes go, by the normal action of the sympathetic. If this is so, one still requires to know why the inco-ordination fails; and whether, in some cases, there may not be a fault on the side of the mucosa, which fails to furnish a proper afferent stimulus.

Finally whether, as an extreme measure, it would be justifiable to excise the cardia and make an end-to-end junction between the œsophagus and stomach, may be a suggestion worth consideration.

Major A. F. HURST, R.A.M.C.: I do not like the term "œsophagectasia" proposed by Dr. Batty Shaw and Dr. Woo, as the dilatation is secondary and not primary. In one of my cases, which I had the good fortune to see as early as the second day on which obstruction occurred, dilatation had not yet had time to develop. As Dr. Batty Shaw has apparently only read the remarks I made when showing a case before the Clinical Section in May, 1914, I should like to explain more fully my views, which were published in the *Quarterly Journal of Medicine*, 1915, viii, p. 300. In May, 1914, I had not seen the paper published in 1896 by Dr. H. D. Rolleston, in which he expressed views somewhat similar to mine, although I believe that the circular muscle fibres at the cardia are alone concerned, and that there is no evidence of any abnormality in the behaviour of the longitudinal fibres. Every time a peristaltic wave passing down a muscular tube reaches a sphincter, the sphincter relaxes in order to allow the contents of the tube to proceed. If for any reason this normal relaxation is absent, the contents of the tube accumulate behind the sphincter. This absence of the normal relaxation is the condition which I have called achalasia; its occurrence at the pylorus, ileo-cæcal sphincter, pelvi-rectal flexure and anus accounts for a number of pathological conditions. Achalasia of the cardia causes food to accumulate in the œsophagus, which gradually becomes dilated; it is not surprising that the efforts made by its muscular coat to overcome the obstruction offered by the closed cardia lead in time to hypertrophy, when the extremely powerful character of the peristaltic waves is seen with the X-rays. The stagnation of food in the œsophagus leads to catarrh of the mucous membrane, so that the dilatation, muscular hypertrophy, and changes in the mucous membrane are all secondary to the achalasia of the cardia. The cardiospasm theory is untenable because of the absence of hypertrophy of the cardia, which would certainly develop in course of time, as the condition may persist for as many as twenty years; moreover, a soft rubber tube, closed at its lower end and filled with mercury, drops into the stomach without meeting any resistance at the cardia, such as would occur if spasm were present, and it can be readily withdrawn without being gripped in the way the finger is gripped when withdrawn from the rectum in cases of anal spasm, or the mercury tube is gripped when true œsophageal spasm is present, as a result, for example, of ulceration. With regard to Dr. Batty Shaw's theory of a kink at the cardia, no anatomical or other evidence has been brought forward in its support. The inconstancy of the obstruction in the early stages is much more in accordance with some upset in the neuromuscular mechanism of deglutition than with an anatomical peculiarity which, if present once, would be present always. Moreover, the obstruction manifests itself already when the first mouthful of a meal is swallowed, whereas, according to the kink theory, it should not occur until the stomach is distended. I agree with Dr. Batty Shaw that the condition is not uncommon, as I saw as many as five cases in private and two at Guy's Hospital between 1911 and 1915. Achalasia is, I believe, also the cause of the comparatively common condition known as water-brash, in which faintly alkaline watery fluid, consisting of saliva, sometimes mixed with œsophageal secretion, is brought up. It occurs most commonly in conditions like duodenal ulcer, which are associated with hyperacidity; at the end of a meal, when the acidity of the stomach has reached its maximum, excessive secretion of saliva is reflexly called forth; the saliva is swallowed, but accumulates in the œsophagus, as the cardia remains closed owing to the presence of excess of acid in the stomach. It is impossible to explain in any other way how alkaline fluid, unmixed with food, can be brought up in large quantities when the stomach is full of food mixed with acid juice, which may subsequently be vomited, as the alkaline and acid fluids cannot possibly come from the same viscus. Finally, I should like to add a few words about treatment, as I believe that the condition can always be relieved without the aid of any operation. In five of my patients the mercury-tube was used, and led to more or less complete recovery, though it is still occasionally passed by some of them. In the very early case already referred to permanent recovery followed the passage of an ordinary bougie on a single occasion, and in the remaining case, one of twenty years' standing, the dilatation was so great that the end of the mercury tube was seen with the X-rays to coil round in the pouch formed by the lower end of the greatly dilated œsophagus so that it never reached the cardia, which was on a slightly higher level; I believe that improvement subsequently followed dilatation with an instrument passed over string, which had been swallowed by the patient.

Dr. A. W. Woo: The treatment of this condition (œsophagectasia) has interested me very much. In looking over the reports of cases by writers on the subject, I find that considerable success has attended their methods. Lockwood, for instance, in 1906 described a case in which the treatment consisted in dilating the cardia by means of an instrument which consisted of an ordinary œsophagus tube with a distensible rubber bag around the last 4 in. or 5 in. of the stomach end.[1] This proved quite successful. In the *Annals of Surgery*, 1906,[2] Sippy, of Chicago, reported several cases in which the symptoms were completely removed by dilating the cardia. In the treatment of these cases the instrument used by him consisted of a rubber bag 3½ in. long, enclosed in a silk bag, which limited the distension of the rubber bag to 15 cm. circumference. When in a collapsed condition the diameter of this apparatus was half that of an ordinary stomach tube, the apparatus was introduced and held in position by a bougie, then inflated: one or two applications were found to be sufficient and no anæsthetic was required. Another method of treatment by dilatation was that adopted by Major Hurst, who used rubber tubes filled with mercury without the bag. He met with considerable success in a number of cases. Some writers have thought that resting the œsophagus would have the desired result. Gastrostomy was accordingly performed in a few instances; the results obtained, however, were not satisfactory. On carefully going into the symptoms of these cases I find I am able to classify them as follows: (1) Those of slight degree of obstruction not warranting operative measures; (2) Those of severer nature, but admitting a small-sized bougie; (3) Those in which the obstruction is sufficient to prevent the passage of an instrument. As regards the treatment I have formed the opinion that, in the first class of case, all that is required is careful dieting and attention to general health. I think the success of this method of treatment in these slighter cases has been demonstrated in many instances. In the second class of case I think systematic and careful dilatation should prove successful. In the third class of case I do not hesitate to suggest that such cases should be treated first by gastrostomy, then by dilatation with more suitable apparatus.

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[1] *Brit. Med. Journ.*, 1906, i, p. 1367.

[2] *Ann. Surg.*, 1906, xliii, p. 858.

Mr. HERBERT TILLEY: In spite of the forcible arguments which have been advanced by previous speakers against the "spasmodic" theory, I still feel reluctant to give it up entirely, because I have been so impressed with the degree of spasm which the œsophagus is capable of exerting. For example, if a small foreign body lodges in the upper third of the gullet, it may produce such a degree of spasm that neither fluid nor solid can be swallowed. A similar result may be produced by a small superficial ulcer at the lower end of that viscus. Then again, we have those cases of phreno-spasm (so-called cardio-spasm) of functional origin with dilatation of the œsophagus in which the attacks of dysphagia may be cured by one, two or more divulsions of the hiatal or phrenic portion of the œsophagus. Lastly, there is the argument of practical experience in the use of the œsophagoscope. In the majority of these cases of œsophageal dilatation, when the distal end of the tube reaches the hiatal constriction of the gullet, this is seen to be closed, but it gives way to a little gentle pressure and the tube enters the œsophageal portion of the cardiac portion of the stomach. The resistance is practically absent under general anæsthesia, but it is very definite when œsophagoscopy is practised without any anæsthetic—local or general. I submit that spasm appears to be an explanation of these facts. And this leads one to another point of practical importance, for I wish to protest against any inference being drawn from the blind passage of bougies in any affection of the gullet. In any case of difficulty of swallowing which cannot be explained by the laryngoscope, the œsophagoscope should be passed and every inch of that viscus should be inspected by the naked eye. It is the only way in which we can determine, once and for all, the nature of the lesion which is present. Such a method of examination would only be contra-indicated in the presence of an aneurysm or an extremely feeble condition of the patient from other causes. Radiography must go hand in hand with œsophagoscopy, but the physician who relies on radiography or fluoroscopy to the exclusion of œsophagoscopy will not rarely make an altogether wrong diagnosis. With regard to treatment, the only method of curing the dysphagia is by mechanical divulsion of the hiatal portion of the œsophagus, and instruments are now made by means of which this can be done under the guidance of direct vision through the œsophagoscope. I purposely speak of curing the symptom rather than the lesion, because once a pathological dilatation of the gullet has been produced it always remains. In conclusion, and for the consideration of those who have this afternoon advanced different theories as to the causation of "œsophagectasia," I would like to say that a case has been recorded in an infant, aged two days, by Dr. Chevalier Jackson, Pittsburg, U.S.A. It was cured by the passage of a small œsophagoscope (*vide* "Peroral Endoscopy," p. 507).

Dr. C. R. BOX: The skiagram which I show is from a patient with œsophageal dilatation at present under my care. It was taken with the mercury tube *in situ* and confirms the advisability of passing the tube, for the first time at all events, under the guidance of the fluorescent screen. The sharply defined shadow of the tube is seen to deviate rather abruptly to the right of the heart shadow and on approaching the lower limit of this to turn almost at a right angle and lie parallel with the surface of the diaphragm. The tube has not penetrated the cardia at all and there is no doubt that previous passages were equally futile. The œsophagus in this case is evidently elongated to a considerable degree as indicated by its flexuous course. The distance the tube passes may be no index to the position of its lower end which, in this patient, impinges on a small œsophageal cul-de-sac to the left of the cardia.

Dr. F. PARKES WEBER: In regard to the question of "water-brash" or "pyrosis," it may be noted that some persons suffer from a recurrent œsophageal "pseudo-vomiting" of saliva, which was mixed with blood in the kind of cases (especially women) described in 1893, by Nové-Josserand, under the term, "hæmosialemesis" (vomiting of saliva and blood).[1] Functional obstruction at the cardiac end of the stomach of the kind under our to-day's consideration may sometimes be a very grave disease indeed—a disease, in fact, which sooner or later may lead to death by inanition. Such were the deaths formerly attributed to "spasmodic stricture of the œsophagus," when the patients during life were supposed to be suffering from cancerous stricture of the œsophagus, though at the necropsy no cancer nor cicatricial stricture could be discovered. In very bad cases, I think, an attempt at some radical operative method of treatment, as suggested by Mr. Shattock, would be justified. But perhaps the surgeon might be able to enlarge the channel by a plastic operation on the cardia, analogous to the operation of "pyloroplasty" on the pylorus—that is to say, he might be able to make a longitudinal incision through the cardia, then open out the wound, and sew it up transversely.

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[1] Cf. A. Mathieu, "Pseudo-vomiting," *Med. Press*, Lond., 1912, cxliv, p. 483. In young men with gastroptosis copious salivation and "œsophageal pseudo-vomiting" of saliva, without any heartburn, may sometimes be induced by violent exercise (for instance, a game of football) after a considerable midday meal. These disagreeable symptoms which I refer to subside when the recumbent position is assumed, and therefore I suppose that they are the expression of a reflex disturbance due to the "dragging" of a full stomach in cases of enteroptosis. Cf. F. Parkes Weber, "Reflex Salivation from Abdominal Disorders," *Edin. Med. Journ.*, 1900, N.S., vii, p. 348.

Dr. DUNDAS GRANT: I associate myself entirely with Mr. Tilley in his protest against the blind use of œsophageal bougies in cases of possible dilatation of the œsophagus due to cardio-spasm, and in his plea for the use of the œsophagoscope. The X-ray examination is of primary importance in diagnosis, and under the guidance of the X-rays I was able in Dr. Batty Shaw's case to pass a bougie through the constriction. According to subsequent reports, the patient's swallowing was considerably improved. Guisez, of Paris, and Starck, of Heidelberg, both describe appearances seen by the œsophagoscope which they consider characteristic of cardio-spasm as distinguished from other forms of mechanical closure of the cardiac—or, perhaps, more properly the diaphragmatic—narrowing, namely, symmetrical cushiony swellings on each side of or around the orifice. The chief point in diagnosis is no doubt the exclusion of malignant disease, and, along with the history, these œsophageal appearances may assist in the diagnosis. I am particularly interested in Major Hurst's remarks about water-brash, which I have always considered to be caused by an accumulation of pharyngeal secretions above a constriction in the œsophagus. When I was a practitioner of general medicine, I saw a considerable number of cases of this condition which failed to answer to other treatment, but in which I was able to give extraordinary relief by the administration of soda and belladonna, and in one case the patient allowed me to pass an ordinary soft rubber stomach-tube, which also seemed to afford relief. Probably this condition is due to mild intermittent cardio-spasm.

Dr. BATTY SHAW (reply): In reply to the criticism that the term "œsophagectasia" is a very cumbersome one, I think the criticism is a little unfair. In the first case it is little more cumbersome than the word "œsophagoscopy," which has been introduced to describe the operation of looking down the œsophagoscope; and, secondly, I think it is in harmony with the term "gastrectasia," used to describe a kindred condition occurring in the stomach, and restricted by some to describe the condition in which the stomach is permanently dilated; and yet there is no explanation, or there are only purely theoretical explanations, to account for the condition. I cannot but think that after the discussion on this paper, it will be obvious to those who have no theories to advance that the true explanation is not yet forthcoming. Mr. Shattock's cogent argument in favour of the use of an alternate expression, "idiopathic dilatation of the œsophagus," to describe these cases is to my mind unanswerable; but I still think that for mere brevity's sake "œsophagectasia" is a reasonable alternative. Now, turning to Major Arthur Hurst's explanation of the cause, I feel that the arguments that he put forward to show that the explanation of this condition is that, for some reason or another, the physiological relaxation of the cardia fails to take place when a bolus of food is propelled down the œsophagus by its peristaltic action, may also be used as a proof that the obstruction is due to an anatomical kink at the cardia. This is notably the case with regard to the fact that when a bougie is passed through the obstruction, it is not grasped as by an active spasm, but is withdrawn quite easily. I regret very much, however, that we have not referred in our paper to Major Hurst's further contribution on this subject in the *Quarterly Journal of Medicine.*[1] Even after perusal of this paper, however, I think the reader will feel that the root difficulty in accepting his explanation is that he gives no explanation why the cardia does not relax. Our explanation does at least find a cause, an anatomical one; but we admit that we have not substantiated the possibility by anatomical demonstration. I cannot follow Mr. Shattock's argument that if this kink existed, evidence would be found at a post-mortem—at any rate, in the way in which post-mortems have been hitherto carried out. Nevertheless, it is a fair criticism that the burden of the actual proof of the existence of this kink rests with us, and we must endeavour in the future, now that these cases are shown to be capable of diagnosis during life, to carry out an adequate necropsy to prove our point. Mr. Shattock's suggestion that there is a "peccant" spot at the cardia which is hypersensitive, and is the cause of the trouble, also needs anatomical substantiation of a most thorough character before we could ask a surgeon to excise the area for the purposes of a cure. The discussion has turned on the pathogenesis of this condition; but there is a point in our paper which has unfortunately missed criticism, and that is, that in two cases the analysis of the test meals showed the presence of combined protein hydrochloric acid. We have discussed this point with Dr. F. H. Teale, and he stands by his observations, and gives as an explanation that the tube used to abstract the meal really did enter the stomach. But we have heard this evening how difficult it is in these cases to pass a tube or bougie through the cardia, and I have seen this same difficulty even when it was attempted to be passed by means of an œsophagoscope. Dr. Box has shown us, by means of an X-ray picture, how easy it is to conclude wrongly that an instrument has passed successfully, judging by the length of the instrument used; for his picture shows that it simply curled round, and did not enter the stomach. This difficulty merely shows a further reason for reading our paper. We have already seen that an X-ray examination in two cases, when not properly carried out, fails to detect these cases; and now we see that the chemical analysis of a test meal in two cases may give the impression that we are dealing with stomach disorder, when all the time the trouble is œsophageal.

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[1] *Quart. Journ. Med.*, 1915, viii, p. 300.

(*November* 28, 1916.)

Acquired Syphilis of the Lungs.

By F. Parkes Weber, M.D.

Case I.—The patient, J. S., aged 59, a seaman, was admitted to hospital on January 3, 1916, suffering from bronchitic and asthma-like symptoms, with frequent moderate pyrexia (up to about 100° F. in the evenings), suggesting pulmonary tuberculosis. There were signs of emphysema of the lungs and some inspiratory crepitation at the base of the left lung, but there were no signs of localized tuberculous lesions anywhere, and the mucopurulent sputum was repeatedly examined for tubercle bacilli, always with negative result. Röntgen skiagrams of the lungs showed (Dr. James Metcalfe) enlargement of the hilus glands. A point that attracted my attention was that the patient presented very marked and typical so-called "syphilitic leucodermia" of the neck, and on examination it was found that his blood serum (Dr. H. Schmidt) gave a positive Wassermann reaction for syphilis. An expectorant mixture was prescribed containing 7½ gr. of potassium iodide (three times daily) and this was taken from January 6 to August 24; and on five occasions small doses of salvarsan were injected intravenously. When he left the hospital on September 29, 1916, though his bronchitic symptoms were not cured, he seemed on the whole better, and he had gained 3½ kilograms in body weight.

I regard the case as one of chronic tertiary syphilitic disease of the lungs, with peribronchitic fibrotic changes. The syphilitic leucodermia was of some diagnostic importance, and it is interesting that this really valuable sign of previous syphilis is supposed to occur relatively rarely in male patients.[1]

Case II.—K. N., aged 56, a waiter, admitted to hospital on February 29, 1916, for signs suggesting fairly advanced pulmonary tuberculosis. There was much nummular mucopurulent sputum, and on auscultation of the thorax crepitation was heard over the left front and over the upper parts of both lungs. The left lung was most involved, and on another occasion I noted a good deal of crepitation over the back of that lung, especially in the interscapular region. There was not much dullness to percussion. I thought that the case was one of advanced pulmonary tuberculosis; but there was practically never any pyrexia; repeated examination of the sputum failed to reveal the presence of tubercle bacilli; and the patient's blood serum (Dr. H. Schmidt) gave a positive Wassermann reaction for syphilis. Moreover, there was abductor paresis of the left vocal cord, which is a rarer complication of intrathoracic tuberculosis than of malignant disease or syphilis. The patient said that he had suffered from pleurisy fifteen years ago and had lately had copious expectoration. He was subject to occasional epileptic attacks. There were no signs of any disease in the abdominal viscera. Under treatment in the hospital by iodide of potassium (15 gr. three times daily) from admission (in February) to April 4, and afterwards with cod liver oil and extract of malt, the patient's health improved greatly. When he left the hospital on June 26 he had gained 4 kg. in body-weight, but there was still much mucopurulent expectoration. I have no doubt that the case was one of tertiary syphilitic disease of the lungs and of the mediastinal lymphatic glands, the latter giving rise also to paralysis of the left recurrent laryngeal nerve. There was probably also a good deal of bronchiectatic dilatation secondary to the chronic syphilitic disease.

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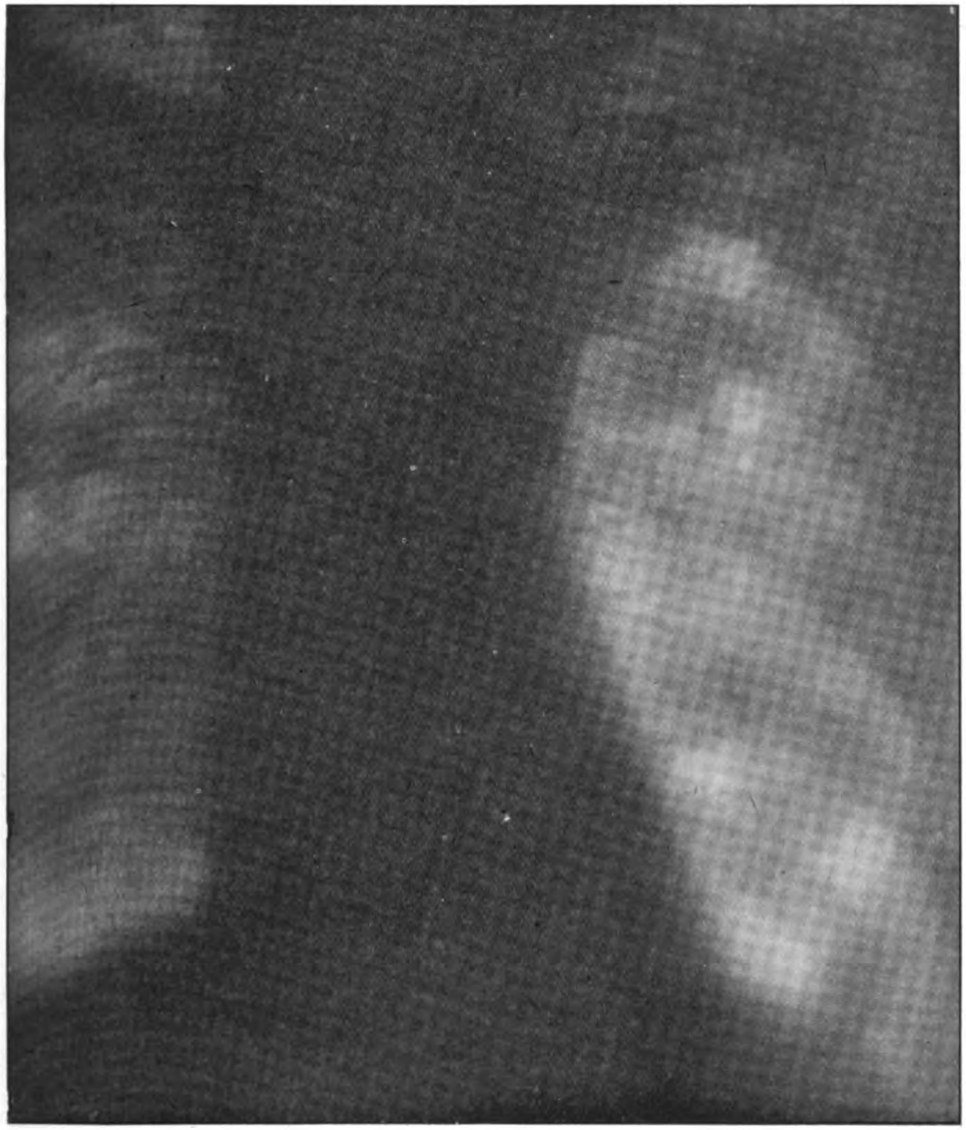
[1] Cf. G. Pernet, *Proc. Roy. Soc. Med.*, 1911, iv, *Sect. Derm.*, p. 103. Cf. also the list of cases given by A. Brandweiner in his monograph, "Leucoderma Syphiliticum." Leipzig and Vienna, 1907.

The paralysis of the left recurrent laryngeal nerve in this case was certainly not due to aneurysm, but the appearance in a Röntgen skiagram of the thorax, taken early in March, 1916 (*see* figure), was, according to Dr. James Metcalfe, somewhat suggestive of a mediastinal growth. He reported that in the great vessel area above the heart there was a dense shadow, which was nearly as wide as the whole cardiac shadow, and that there was considerable irregular opacity in the upper part of both lungs, but especially the right lung. A skiagram taken later on (May, 1916) unfortunately did not show the details very distinctly, and the two skiagrams could therefore not be compared in regard to the question of improvement.

Case III.—R. M., aged 42, a seaman, was admitted to hospital on March 9, 1916, complaining that during the last eighteen months he had been subject to pains in the lower left region of the thorax and spasmodic attacks of coughing. Some of the attacks of coughing were accompanied by much mucopurulent expectoration, and occasionally sputa streaked with blood were coughed up. There was a history of syphilis twenty-four years ago, and the Wassermann reaction (Dr. H. Schmidt, March, 1916) was found to be weakly positive. In the hospital I noted crepitations and creaky dryish sounds localized to the area of the lower left side of the thorax external to the heart. No other signs of disease were discovered. The brachial systolic blood-pressure was 120 mm. Hg. The urine was free from sugar and albumin. There was no fever. The sputum was frequently examined for tubercle bacilli, always with negative result. An expectorant mixture was ordered.



Röntgen skiagram of thorax from Case II (March, 1916).

Potassium iodide was tried but was discontinued owing to its producing conjunctival irritation and swelling in the fauces and face.[1] Six small intravenous injections of salvarsan were given, at intervals of two weeks or so. About the middle of May by ordinary examination of the lungs I could find no abnormal physical signs, excepting a few inspiratory crepitations after coughing, about the lower angle of the left scapula; but a Röntgen skiagram showed (Dr. J. Metcalfe) much hilus lymphatic gland enlargement and peribronchial thickening. When patient left the hospital on June 13, 1916, nothing wrong could be found with him by ordinary examination. On November 2, 1916, he was, however, readmitted with his old trouble, violent paroxysms of coughing accompanied by mucopurulent expectoration. There was slight pyrexia (up to about 100° F.) on the first two days following his readmission. By ordinary examination I could find nothing abnormal excepting some dry bronchitic and "squeaky" sounds at the base (behind and at the side) of the left lung. A Röntgen skiagram showed (Dr. J. Metcalfe) "increased shadowing in the great vessel area and much bronchial gland enlargement at the hilus on both sides." No tubercle bacilli could be found in the sputum.

The disease in this case seems to be chronic syphilitic peribronchitis, chiefly localized to the base of the left lung, perhaps accompanied by some bronchiectatic dilatations and local pleuritic adhesion.

Case IV.—P. L., aged 55, a strongly built man, was admitted to hospital on August 15, 1915, with moderate fever and signs which I supposed to indicate pneumonia in the lower part of the right lung. (Pulse on admission 94, and respiration 36, per minute.) The patient said that he had had "rheumatism" in February, 1915, and that the present illness commenced with shivering and vomiting on August 12. In the hospital the fever gradually disappeared by August 21. There was another period of fever from August 26 to 31 inclusive, and there was again a little fever about September 5, but none afterwards. On August 28 some tender swollen lymphatic glands were felt in the right axilla. (It should be noted in this connexion that the patient had a scar from a recently healed burn on the back of the middle finger of the right hand.) Later on the tenderness was less, but the swelling increased and the glands were enlarged, not only in the right axilla, but above and below the right clavicle. On September 3, there was still a little impairment of resonance in the right infra-scapular region, and a slight murmur was heard accompanying the first sound at the cardiac apex. The abdominal viscera were apparently free from disease, and no albumin nor sugar were present in the urine. The brachial systolic blood-pressure (August 18, 1915), was 135 mm. Hg. A blood count (September 4) showed very slight excess of red cells. The blood serum (Dr. H. Schmidt, August 31) gave a positive Wassermann reaction for syphilis (and so did his wife's blood serum, when she was under hospital treatment in April, 1916). He admitted having had a chancre about eighteen years ago. On September 3, treatment with potassium iodide (15 gr. three times daily), and Zittmann's decoction was ordered, and on September 29, a course of mercurial inunction was started. The glandular swelling disappeared by about the middle of October.

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[1] With this idiosyncrasy towards iodides may be compared the swelling of the parotid or submaxillary salivary glands (or of both parotid and submaxillary glands), and the thyroidal disturbance, which occasionally constitute unusual (and sometimes misleading) manifestations of iodism.

I think that in this case the pulmonary trouble was possibly, but not certainly, syphilitic. He was afterwards under treatment for frontal sinus disease, and except for that and some "rheumatic" pain in one shoulder, he seemed quite well. But the Wassermann reaction was still positive in November, 1915, not long before he left the hospital.

Case V.—B. S., aged 46, a fairly well-nourished married woman, was admitted to hospital many years ago,[1] with pulmonary symptoms. About a year previously she had been treated in the out-patient department for secondary syphilis. For about four weeks before admission she had been suffering from a dry cough, worse at night, with hardly any expectoration. No history of any previous thoracic disease was obtained. On admission there was a localized patch of bronchial breathing in the left lower axillary region, over which dullness to percussion was noted. There was also some impairment of resonance over the greater part of the infra-scapular region on the same side. Pulse, 64 per minute, regular. There was no fever. A localized gummatous affection of the pleura and lung, with a little pleuritic effusion, might have accounted for the symptoms. The patient was treated with potassium iodide and given full diet. In a few days the bronchial breathing could no longer be detected, but some crepitation or scraping sound could be heard in its place. The cough soon ceased. The patient left the hospital before the abnormal signs had quite disappeared. The urine, when tested, contained no albumin and no sugar. The temperature was never found to be above 99° F.

Case VI.—J. B., aged 30, a married woman, was admitted to hospital on August 2, 1913, with diffuse bronchitic signs and moderate pyrexia. The history was that for the last six months she had suffered from symptoms of bronchitis, accompanied by occasional asthma-like breathing. Eight or nine months ago she had suffered from an ulcer on the forehead, which had left a depressed scar, attached to the bone. About the same time her hard palate had become perforated, and the perforation still persisted. About twelve months ago there had also been considerable ulceration about the right ankle. She had had a miscarriage soon after her marriage (which was six years ago), and had been deserted by her husband not long afterwards. In the hospital her cough was very "brassy" and there was apparently some tracheal ulceration. Röntgen ray examination of the chest showed thickening at the hilus of both lungs, and what seemed to be enlarged bronchial glands. The blood serum gave a positive Wassermann reaction for syphilis. No tubercle bacilli were found in the sputum (but this was, unfortunately, insufficiently examined). Expectorants and antisyphilitic treatment were tried. There was very little fever after the first six days in the hospital. About the middle of October, however, the patient became drowsy, as if from chronic carbonic acid poisoning. She seemed to lose the power of expectorating. Death occurred on October 18, 1913, and no post-mortem examination was permitted.

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[1] Cf. F. Parkes Weber, *St. Bart.'s Hosp. Reports*, 1898, xxxiv, p. 305.

REMARKS.

Whilst I was physician to the Mount Vernon Hospital for Diseases of the Chest I practically never saw a case which I could regard as one of pulmonary syphilis, but recently I have met with several in which I believe that that diagnosis can be made with more or less probability. Many writers on the subject have had the opportunity of making post-mortem examinations. The *chief pathological-anatomical features* are: (1) gummatous formation, with tendency to necrotic changes; and (2) the more chronic, and often widely-spread, fibrotic changes, tending to become associated with bronchiectatic dilatations. In the above-described cases I think the changes were chiefly of the fibrotic order, though gummatous formation may likewise have occurred, for instance in Case V, and perhaps in Case VI. According to T. Tanaka,[1] the histology of the pulmonary indurative changes of acquired syphilis is very similar to that of the so-called "white pneumonia" of congenital syphilis. The most characteristic features are much endarteritis obliterans, together with periarteritis and endo-phlebitis. Mesarteritis likewise occurs, and in three cases Tanaka found a noteworthy increase of the unstriped muscle tissue, which he regarded as derived from the walls of the small bronchi, and which had been till then never described as connected with pulmonary syphilis.

In regard to *clinical diagnosis* the question of there being an aortic aneurysm or mediastinal new growth may arise, as it did in Case II, especially if there is paralysis of the left recurrent laryngeal nerve. But the clinical differentiation from tuberculosis is the chief difficulty, for in tertiary syphilitic diseases of the lungs there may be pyrexia, that is to say, a so-called "tertiary syphilitic fever," such as not very rarely occurs in tertiary syphilitic disease of the liver—or else a complicating fever, due to associated bronchitic and bronchiectatic changes with purulent discharge. Moreover, not only may there be pyrexia, but there may also be (though less in frequency and degree than in tuberculosis) night-sweats, emaciation, hæmoptysis,[1] and copious nummular muco-purulent sputum. In pulmonary syphilis, however, the lower parts of the lungs are generally chiefly involved, and the absence of tubercle bacilli from the sputum (on frequently repeated examinations), together with a history of past syphilis, evidence of tertiary syphilitic lesions elsewhere, and a positive Wassermann reaction (when obtained), ought to turn one's attention in the right direction. The presence of typical syphilitic leucodermia in Case I was, as I have already pointed out, of some diagnostic value.

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[1] T. Tanaka, "Beitrag zur Kenntniss der Lungensyphilis beim Erwachsenen, zugleich über sogenannte Muskuläre Lungencirrhose," *Virchow's Archiv*, Berl., 1912, ccviii, p. 429.

In regard to pulmonary syphilis, one has to bear in mind the possible co-existence of syphilitic ulcers or stenoses in the bronchial tubes, trachea or larynx. Stengel (1903) pointed out that one of the most suspicious symptoms is intense dyspnœa of more or less spasmodic type, with a tendency to stridor and cyanosis, all of these being indicative of obstruction in the larger air passages. In some cases the respiratory symptoms are altogether much more severe than the ordinary physical signs in the lungs would lead one to suppose. There may also be, as in my Case III, recurrent severe spasmodic attacks of coughing, accompanied by more or less copious mucopurulent expectoration.

In some cases pleurisy and pleuritic effusion may be associated with pulmonary (gummatous) syphilis, as they probably were in my Case V.

The therapeutic test is, needless to say, always of extreme importance, especially when the patient is found to derive obvious benefit from the use of potassium iodide, a drug which sometimes aggravates the symptoms in pulmonary tuberculosis. Old cicatricial stenoses of the respiratory passages cannot of course be removed by antisyphilitic treatment.

It must always be remembered that pulmonary tuberculosis is not at all rare in syphilitic subjects, and vice versa, that tuberculous patients not very rarely acquire syphilis. I do not think that the two diseases have much effect (either good or bad), one on the course of the other, unless one or both of them have been sufficiently severe to produce a condition of cachexia and generally to lower the resistance of the body towards disease. Pulmonary tuberculosis, as far as I can judge, is uninfluenced by the presence of an old quiescent syphilitic taint. Though by some an antagonism between the two diseases has been supposed to exist, it is more probable that syphilis predisposes to tuberculosis, in so far as it lowers the vitality of the organism; and it is not unlikely that syphilitic tissues (as has been maintained[1]) constitute a specially favourable soil for the growth and multiplication (within the body) of tubercle bacilli. When the tuberculosis is active and the syphilis quiescent or obsolete, the former naturally dominates the whole clinical aspect and the prognosis, and the effect of energetic antisyphilitic treatment by mercury and potassium iodide is not unlikely to be a bad one. Though salvarsan and neosalvarsan, in moderate doses, seem to do no harm in ordinary cases of pulmonary tuberculosis, yet they do no good so far as I know, although this is contrary to opinions which I think have been expressed by some writers.[2]

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[1] In some cases of hæmoptysis many spirochætes have, I believe, been found in the sputum, though doubtless not the *Spirochæta pallida* of syphilis.

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[1] Cf. R. W. Taylor, "Bone Syphilis, Hereditary and Acquired," *New York Med. Journ.*, 1907, lxxxv, p. 7. Cf. also, on the whole subject, Émile Sergent, "Syphilis et Tuberculose," Par., 1907. Gouget also (*Journ des practiciens*, Par., 1910, xxiv, p. 771) maintains that while tuberculosis does not predispose to syphilis, the latter certainly does to tuberculosis.

[2] For a discussion of this subject see, however, N. B. Potter, "Salvarsan in the Treatment of Double Infections, Tuberculosis and Syphilis," *Amer. Journ. Med. Sci.*, Philad., 1916, clii, pp. 823-845.

Section of Medicine.

President—A. E. GARROD, M.D., F.R.S., Colonel A.M.S.

(*June* 12, 1917.)

(Chairman—THE PRESIDENT OF THE SOCIETY (Sir RICKMAN GODLEE, Bt., K.C.V.O., M.S.)

Tropical Diseases in the Balkans.

By ALDO CASTELLANI, M.D., M.R.C.P., Lieutenant-Colonel.

(*Royal Italian Medical Service, Navy, Balkanic Zone.*)

THE present paper is based on the work I have done in Serbia, Macedonia and other parts of the Balkanic and Adriatic zones during the last two years. It is not my intention to go fully into every tropical disease to which the allied troops are exposed in those zones, but merely to touch on a few points and features of each malady which have especially attracted my attention.

My remarks, based on my own clinical experience, though of little or no scientific importance, may perhaps be useful to medical officers joining the Salonika Army, as certain clinical points to which I refer are hardly mentioned in text-books or are given in a way which at times does not correspond with what one actually sees in practice in the Balkans.

I use, of course, the term "tropical diseases" *sensu lato,* or very few maladies indeed would remain in the domain of the tropical specialist. As a matter of fact certain diseases which are often called tropical—as for instance "typhus exanthematicus" and "Malta fever" are of more frequent occurrence in temperate zones and sub-tropical zones than in the Tropics.

Before beginning to relate my observations, I feel it my duty to place on record my great indebtedness to the military authorities of the British, Italian, French, Serbian, and Russian Armies; and I wish also to express my thanks to the Serbian Relief Fund and its Committee, and to the American Red Cross Commission, to the hospitals of which I have been attached on several occasions and where I have carried out a certain amount of my researches.

I beg to express my thanks to Surgeon-General Rho, the Chief of my Service, for permission to publish this paper.

MALARIA.

The number of cases of malaria throughout the Adriatic and Balkanic zones during the years 1915-16 has been appalling, and the cases of pernicious type quite common. Malaria has been the disease which has caused by far most invaliding among the allied troops.

Unfortunately during recent years in certain quarters in Europe and even in tropical countries, there arose a tendency to consider malaria as being a not very dangerous disease, and that its importance had been somewhat exaggerated—its prevention and cure being, in theory, a very simple matter. The present experience in the Balkans has, therefore, come as a rude awakening, and has shown what a terrible scourge this disease can be.

The experience we have had in Serbia, Macedonia, and the Adriatic zone, in addition to showing the frequency and seriousness of this malady, has also shown what a protean disease it is. This, of course is nothing new to the old tropical practitioner, but it is decidedly bewildering to the young medical man just out from home. It is especially on these protean features of the malarial infection, as well as on the prognosis and treatment of the malady, that I should like to say a few words.

It may be said at once that in the Balkanic zone the classical malarial fevers, as described in books, are not frequent. The clinically atypical cases are extremely numerous, and the patient may present symptoms pointing to the most different pathological conditions; indeed there are very few internal diseases which malaria may not simulate, and it may even give rise to syndromes closely resembling acute surgical conditions.

I shall take, to begin with, the diseases of the blood.

Diseases of the Blood.

The Purpuric and the Hæmorrhagic Type of Malaria.—Near Skopolje, in Serbia, in September, 1915, an outbreak of so-called scurvy was reported as occurring in a Serbian regiment, and I was asked to investigate the condition. The patients were extremely pale, felt very weak and languid, complained of pains in the loins and limbs; in most cases the whole body was covered with petechiæ, and tense, indurated swellings due to large extravasations of blood were present in several cases. In many of the patients bleeding was taking place from the gums, which were swollen and spongy, and from the nose; in two cases there were hæmorrhages from the stomach and the intestine; in one there was hæmorrhage from the lungs and bronchi; in another from the kidneys and bladder. In none of the cases was fever noticed, but the presence of a large indurated spleen in two of the patients, and the fact that I had seen similar cases in the Tropics, made me suspect malaria, and, in fact, the blood examinations made soon after showed presence of malaria parasites, though only in about 10 per cent. of the patients. However, all of them were put on quinine, and all the symptoms improved in a remarkably rapid manner, and disappeared completely within three to six weeks. In some cases I gave calcium lactate in association with quinine, but I soon found out it was unnecessary. The diet was not changed in any way. This hæmorrhagic type of malaria must be distinguished from the ordinary types of purpura, from scorbutus, also from a peculiar hæmorrhagic affection, without jaundice, of spirochætic origin.

The Pernicious Anæmia Type of Malaria.—Of this type I have seen several cases both in the Balkans and in tropical countries. The appearance of the patient is quite different from what one sees in ordinary malarial cachexia, and there may be no history and no sign whatever pointing to a malarial infection. The patient is generally a young man or woman with the typical pallor and the lemon-yellow tint of pernicious anæmia; in some cases the liver is slightly enlarged, or, more rarely, the spleen; there is no fever, or just 99° or 100° F. at night, which is quite common also in true pernicious anæmia. The blood may be negative for malaria on repeated examinations, and may show most of the common features of pernicious anæmia, such as poikilocytosis, nucleated red cells, high colour index, relative increase of the small mononuclears instead of the large mononuclears, as one would expect in malaria.

We had one such case for several months in 1915, at one of the Uskub hospitals. The patient, a Serbian soldier, aged 21, was fairly well nourished but very pale, with a lemon-yellowish tint; he was always very languid and apathetic and stayed in bed the whole time; no fever, no enlargement of spleen or liver. Blood: 2,100,000 red blood corpuscles; marked poikilocytosis, some nucleated erythrocytes present; leucocytes, 5,000, with a large increase of the lymphocytes (55 per cent.), instead of the large mononuclears as one would expect in a malarial condition. He was considered to be a case of pernicious anæmia, and accordingly was treated with arsenic for several months, when suddenly one day he had a rigor, the temperature going up to 105° F.; the spleen became just palpable and a few subtertian rings were found in the blood. A quinine treatment by intramuscular injections was immediately started, and within two months the patient was so improved that he was discharged, and returned to his regiment.

In old individuals the profound anæmia may give rise to the suspicion of *internal cancer*. A man aged 60 was admitted to Sorovich Hospital in a condition of profound anæmia; he was greatly emaciated, with no fever, no enlargement of the spleen or liver, dyspeptic symptoms dating from several months; complete loss of appetite, pain after food, and vomiting, which he said was of a very dark colour. The doctor who had attended him very naturally had suspected cancer, especially as the usual treatment for dyspepsia, dieting, &c., had completely failed. Some time after his admission to hospital, the examination of the blood one day revealed the presence of a few Laveran's crescents. A quinine treatment caused all the symptoms to disappear within a few weeks.

Diseases of the Nervous System.

The Polyneuritic Type.—This type has been denied by many observers, but I have come across a number of cases both in the Balkans and in the Tropics. I would call attention to the type of malarial polyneuritis which simulates wet beri-beri very closely. The patient is œdematous, there is the characteristic gait, knee-jerks absent. No fever, no enlargement of the spleen and liver. In two such cases the blood showed Laveran's crescents. They both got well on quinine given in large doses by the mouth, and by intramuscular injection. One of my patients suffering from malarial polyneuritis showed peculiar mental symptoms with loss of memory for recent events—a condition resembling Korsakov's disease, polyneuritic psychosis. A similar case has been recently ably described by Dr. H. Carlill.[1]

As regards cases of mononeuritis and neuralgia, tic, &c., of malarial origin, these are, as well known, quite common. I have seen an interesting case of *meralgia paræsthetica*, which had resisted every treatment for months, yield to quinine in twenty-four hours.

Malarial syndromes of the central nervous system are quite common in the Balkans. I may mention some of the types I have seen :—

Comatose Type.—This was quite common during the epidemic of malaria in Skopolje and the surrounding districts during August and September, 1915. The patient is brought into hospital comatose; he cannot be roused to answer questions. The respiration may be stertorous, or sometimes quiet. The pupils are often contracted, there may be high fever, or the temperature may be normal or subnormal, and in this case a diagnosis of opium poisoning has occasionally been made. The comatose condition becomes deeper and deeper, and the patient often dies a few hours after admission: though at times intravenous and intramuscular injections of quinine may induce a cure. Very recently a soldier was brought to my ward at the Sorovich Hospital in a comatose condition; temperature 101° F., spleen palpable. He was given at once 30 gr. of quinine intramuscularly (15 gr. both buttocks). He became conscious after a few hours and recovered. The comatose type of malaria is of great interest: it may develop quite suddenly in old malarial patients, also in temperate zones. A most interesting case has recently been observed in London by Professor Hewlett. The patient, a sailor, suffered from very indefinite symptoms and went to a venereal clinic. His blood was tested for Wassermann's reaction, which was found positive. He was given an injection of salvarsan. A few days later the same patient was brought in a comatose condition to the Seamen's Hospital and died within a few hours of admission. At the post-mortem nothing was found pointing to any definite pathological condition, but Dr. Hewlett made a histological examination of the brain, and this revealed enormous numbers of malarial parasites in the capillaries.

The Delirious Type.—In this type, of which I have seen several cases in Skopolje, delirium is the most marked feature: it may be followed by coma and death. These cases have been occasionally confused with alcoholic delirium tremens.

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[1] *Lancet*, 1917, i, p. 648.

The Cerebrospinal Type.—This may simulate cerebrospinal meningitis very closely. A patient was admitted to one of the Uskub Hospitals in September, 1915, with extremely severe headache and vomiting, fever, retraction of head, Kernig's symptom. Blood: Slight leucocytosis, no parasites. A diagnosis of cerebrospinal meningitis was made, the patient isolated and a lumbar puncture performed. The cerebrospinal fluid escaped with higher pressure than normal, but was completely clear. Blood again examined—malaria. All the symptoms disappeared after a few intramuscular injections of quinine.

The hemiplegic and monoplegic types are occasionally met with, simulating cerebral hæmorrhage. I have seen several such cases. Subacute and chronic, cerebral and cerebellar types are not very rare. At the American Red Cross Clinic in Skopolje I saw a most interesting case of the cerebellar type. A man aged about 30 came for treatment showing all the symptoms of a cerebellar tumour: he was ataxic, walking like a drunken man: he complained of severe headache, vomiting, and almost complete loss of vision. His temperature was normal and he did not give any history of fever. Spleen and liver not enlarged; the blood showed numerous crescents. All the symptoms disappeared after an energetic quinine treatment. In Ceylon I have seen a similar case, also cases with symptoms pointing to tumour of some other part of the cerebrum. Some cases have intermittent fever, generally low, and then an abscess is suspected. I have seen a case of bulbar malaria, with difficulty of speech, deglutition, and facial paralysis.

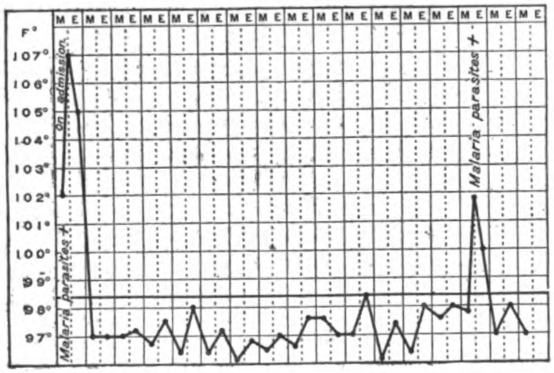

FIG. 1.
Hyperpyrexia.

The spinal types are rare, but I have seen a case of clinically typical transverse myelitis due to malaria. I have seen one case in the

Balkans, and three in the Tropics, of a malarial condition closely simulating *disseminated sclerosis*, with scanning speech, intentional tremor, nystagmus, spastic gait, and increased reflexes. All the cases were cured by quinine.

The mental type of malaria may occasionally simulate mental disease. I have come across two cases of apparent mania, and one of apparent melancholia, all cured by quinine. I have already mentioned a case presenting Korsakov's syndrome.

Specific Infectious Diseases.

Malaria may simulate various specific infections. *The typhoid-like type* of malaria was far from rare in South Serbia and Macedonia in 1915, and I have again seen similar cases very recently near Monastir. From Gevgheli for instance it was reported in September, 1915, that an epidemic of typhoid had broken out. My friend, Dr. Strong, Head of the American Sanitary Commission, Dr. Th. Jackson, and later on myself, went there and soon found out that more than 90 per cent. of the so-called cases of typhoid were cases of typhoid-like subtertian. This type as a matter of fact was fairly common also in Skopolje, and numerous cases were admitted to the Lady Paget Hospital in September, 1915. In this type of malarial fever, as seen in the Balkans (I have seen similar cases in the Tropics), the onset was often slow; the patient looked apathetic and complained of headache; tongue very coated; the fever was continuous or subcontinuous; abdomen slightly tumid, spleen generally palpable, but neither very

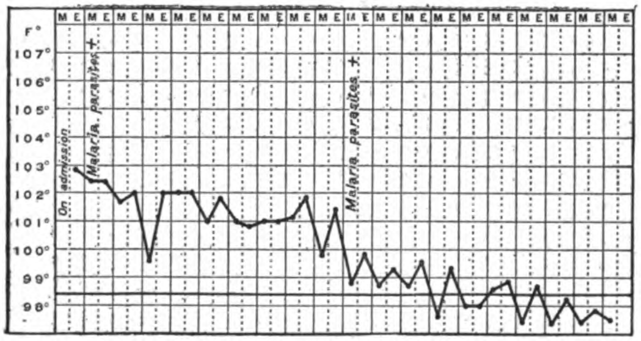

Fig. 2.

Malaria simulating typhoid; hæmocultures and serum reactions for enterica negative.

large nor very hard. The patient had certainly all the appearances of a typhoid case. The blood showed as a rule numerous ring forms, and—a most important feature—quinine given in large doses had practically no influence for a long time either on the fever or the parasites. All the bacteriological examinations for typhoid, paratyphoid, and intermediate germs, were as a rule, negative; very occasionally a case of mixed infection—malaria and typhoid—was found.

Malta Fever Type.—The undulant type of malaria is extremely rare, but it certainly exists. I have seen a case in Macedonia in 1915: the fever of a typical undulant type continued many weeks and was not influenced in the least by quinine 10 gr. t.i.d. given by the mouth for several weeks. Malarial parasites were found in the blood repeatedly; agglutinins for Malta and paramelitensis fever negative. The fever finally yielded to quinine given intramuscularly.

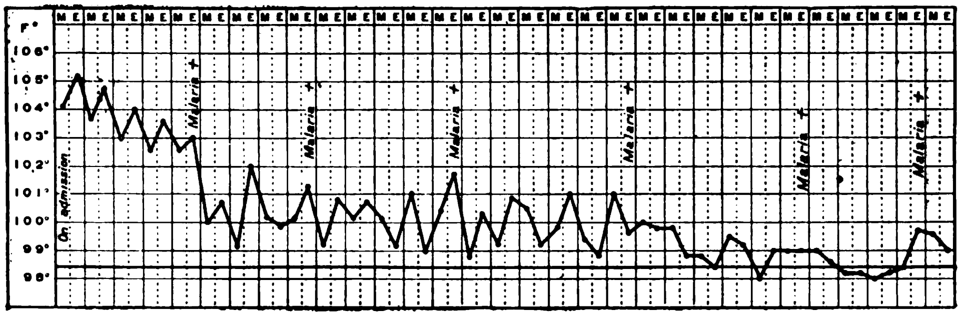

FIG. 3.

Temperature chart of a case of malaria simulating typhoid; hæmocultures and serum reactions negative.

Yellow Fever Type and Weil's Disease.—A Serbian officer in Macedonia suddenly developed fever (temperature 103° F.) with severe headache, flushed face, severe pains in the body, no rigors, pulse quick, full and bounding, severe vomiting with tenderness in the epigastric region; slight albuminuria. On the morning of the third day the temperature dropped to 100° F., the pains disappearing, and the patient felt better, but on the evening of the same day the temperature rose to 105° F., while the pulse became comparatively slow (64 per minute); jaundice appeared, the spleen became slightly palpable, severe vomiting started again, of dark brown colour, containing red blood corpuscles; the jaundice deepened very quickly, all the symptoms became worse, and the patient died on the sixth day, notwithstanding a very intensive quinine treatment. The blood was teeming with subtertian ring forms. The type of fever I have described belongs to the group which the old authors called bilious remittent fever. I saw in an island of the Adriatic zone a very similar case, but with severe hæmorrhages in the skin, closely resembling icterus hæmorrhagicus and terminating fatally. Cases of malarial jaundice simulating a simple catarrhal jaundice were also seen occasionally.

Tetanus-like Malaria.—I have seen a typical case in Macedonia in 1915, and three in the Tropics. The patient had a normal temperature,

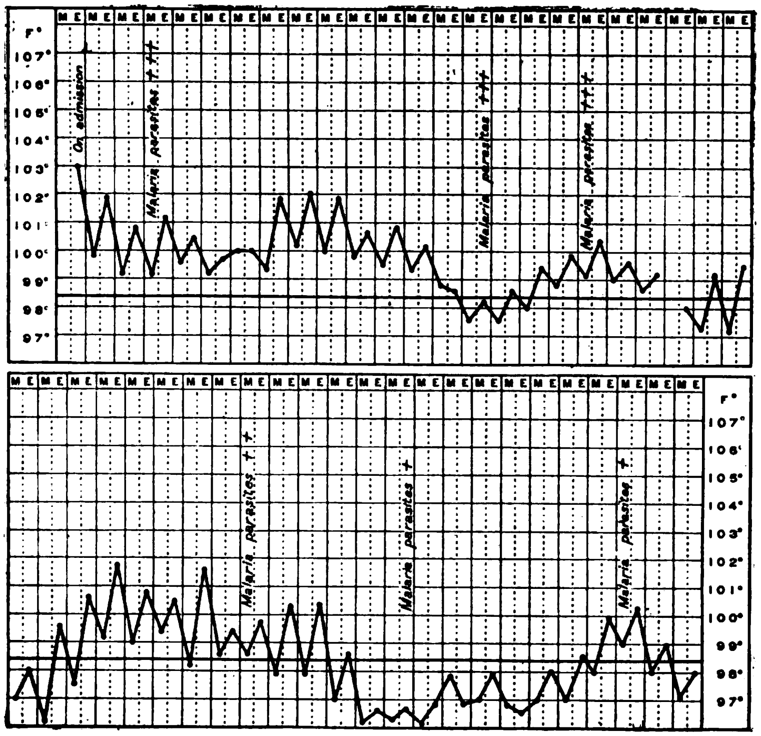

FIG. 4.
Temperature chart of a case of malaria simulating Malta fever.

with trismus opisthotonus, and typical tetanic spasms. In all the cases the blood was +, and an intensive quinine treatment induced a cure.

Hydrophobia-like Malaria.—I was once called by a Ceylonese colleague near Colombo, to see a case which had been diagnosed as hydrophobia. At the time I saw the patient he was in a maniacal condition, temperature 102° F. At the mere sight of water a severe spasm of the larynx occurred. As he had a large spleen I examined his blood with my portable microscope; it was teeming with parasites. Quinine hyd., 15 gr., given by intramuscular injection in each gluteal region, caused all the symptoms of hydrophobia to disappear in a few hours. It may have been a case of hysterical hydrophobia syndrome in a malarial patient, though the man was not of neurotic tendency, and no hysterical stigmata were present.

Sleeping Sickness Type.—This type of malaria, so far as I know, has never been described. I have seen a typical case in a tropical country where sleeping sickness does not exist. The patient had low fever for months, with slight trembling of the hands and tongue and progressive general weakness; he then became drowsy and occasionally had convulsions. The blood examination was negative for every known parasite, until many months after the onset of the symptoms a few malarial parasites were once found. A course of quinine injections cured the patient. A somewhat similar case though not so severe, with general debility, trembling of hands and tongue, very marked drowsiness for weeks, was seen by Dr. Mitchell and myself in Skopolje, but the correct diagnosis in this case was made at once, as the blood was full of malarial parasites. The patient very slowly recovered on being given quinine treatment.

Diseases of the Digestive System.

I have already called attention to those cases of severe malarial anæmia in old people with dyspeptic symptoms which may suggest carcinoma ventriculi. I may mention now a case with symptoms pointing to gastric ulcer which I saw in Ceylon. The patient, a young girl, was very anæmic and had severe gastralgia, the pain shooting often backwards; severe vomiting, hyperchlorhydria. The examination of the blood showed a few malarial parasites. Cases of so-called simple dyspepsia or gastric catarrh, due to a patent malarial infection, have not rarely been observed by me.

Pseudo-dysentery of Malarial Origin.—Of this form two types in my experience may be distinguished: one with typical dysenteric stools containing blood and muco-pus, the other with purely hæmorrhagic stools without any pus, and very little or no mucus. I shall always remember a case of the first type which I once saw in consultation in a tropical country. The patient had been treated with ipecacuanha, anti-dysentery serum, bismuth, salol, nitrate of silver irrigations, &c., for months: it very rapidly and completely yielded to quinine within forty-eight hours. In this case the temperature always had been normal: on examining the patient I was just able to feel the spleen, and this put me on the right track. Blood +. On questioning the patient we elicited the fact that he had had attacks of malarial fever six years previously. Of course one must not forget that there are quite a number of cases of mixed infection: malaria and bacterial or amœbic dysentery; but the case I have described was certainly not one of these; the examination of the stools which I made being negative for entamœbæ and germs of the Shiga-Kruse and Flexner groups. I have seen very similar cases also in the Balkans.

Pseudo-cholera. — During the epidemic of cholera in Ceylon in 1914, I was called to confirm the diagnosis of cholera in a European assistant of one of the big tea firms of Colombo, so that he could be removed to the infectious diseases hospital, which proceeding the patient strongly objected to and was resisting with what little strength he had left. He had been taken ill suddenly in the night with profuse serous diarrhœa. When I was called to see him at 11 a.m., he was feeling very cold, his skin clammy, his cheeks sunken, and he looked very ill indeed. Temperature 99° F., pulse 104. The stools were absolutely cholera-like—the well-known rice water appearance. Examining the patient I found the spleen just palpable, but very hard. On questioning him I found that he had an attack of malarial fever three weeks previously, on an estate where he had gone for a short holiday. The blood was examined at once: it was swarming with ring forms. Quinine was given immediately by intramuscular injection, 30 gr., and the diarrhœa stopped within a very few hours. The patient was up two days later. The complete bacteriological examination of the stools revealed entire absence of the cholera vibrio, or of vibrios of the para-cholera group. A somewhat similar case, not so bad, which also had been taken for cholera, was seen by me in Northern Macedonia in 1915. This case also recovered very quickly on quinine. Cases of the same nature, though not so typically cholera-like, have been seen by me in Corfu and at Salonika.

Cholecystitis Syndrome.—I have seen three cases in Skopolje with all the symptoms of acute cholecystitis due to calculi: severe pain shooting towards the right shoulder, tenderness over the region of the gall-bladder, severe vomiting. In two cases slight jaundice; the spleen was very slightly palpable in one case, liver enlarged in two cases. Blood positive for malaria in all three. All were completely cured by quinine.

Malaria simulating Abscess of the Liver.—I have seen one such case in Ceylon in consultation with a local doctor; the patient had developed his disease on an estate up country where malaria is practically unknown, and he gave a history of having had dysentery ten years previously. When I saw him he had been suffering from intermittent fever for two months; the fever had not yielded to quinine (30 gr. daily by the mouth). Profuse sweatings, loss of flesh, spleen not palpable, liver enlarged but not very hard, severe pain on pressure all over the region of the liver. Blood said to have been negative for malaria every time it had been examined (four times). The day I examined the patient, however, the blood showed a few crescents. An intramuscular quinine treatment supplementing that given by the mouth was ordered, and all the symptoms disappeared within three weeks.

For the benefit of the young practitioner in the Tropics I may say, however, that mistaking abscess of the liver for malaria is a far more common error than mistaking malaria for abscess of the liver; while I have come across only one case of malaria diagnosed as abscess of the liver, I have seen a great many cases of abscess of the liver diagnosed as malaria and drenched with quinine for months, and even years.

Cirrhosis of the Liver of Malarial Origin.—This condition, in my experience, is not very frequent. I treated a typical case, however, in the Lady Paget Hospital in Skopolje in 1915. The patient, a soldier, aged 23, with typical hepatic facies, had ascites. After tapping, one could feel the liver and spleen to be enlarged and hard; the fluid soon collected in the peritoneal cavity, and the feet and legs commenced to become œdematous. After tapping again the liver was found to be much smaller. After repeated examinations of the blood parasites were found; a quinine treatment cured the condition, though very slowly.

Acute Hæmorrhagic Pancreatitis Syndrome.—A man, aged 42, in apparently perfect health, was taken suddenly ill with violent pain in the epigastrium without any apparent reason; this was very quickly followed by very severe vomiting and complete collapse. There was a circumscribed area of very severe tenderness over the upper portion of the epigastric region which was very tympanitic and seemed to be somewhat swollen. A diagnosis of probable acute hæmorrhagic pancreatitis was made by the attending physician, and an operation suggested, but on examining the blood this was found to be swarming with malaria parasites.

Pseudo-appendicitis.—I have seen several cases in the Balkans and two in Ceylon. A Serbian soldier in Skopolje in 1915 was suddenly taken ill with violent pain in the appendicular region; vomiting and fever, but no rigors; spleen and liver not enlarged; palpation revealed severe tenderness and well-marked rigidity all over the right lower abdomen. The blood showed numerous malaria parasites and the patient got well within twenty-four hours after two intramuscular injections of quinine. A colleague had a similar case, with all the typical symptoms of appendicitis. He examined the blood, but no malaria parasites were seen. A surgeon called to see the patient decided to operate, and the appendix was removed; macroscopically it was quite normal. On the third day after the operation the patient had a very severe rigor, and complained again of pain in the cæco-colon region, though more diffuse; his temperature jumped to 105° F., the spleen became palpable, and on examination the blood showed several subtertian rings. Quinine was administered by intramuscular injections and the temperature dropped to normal within thirty-six hours. The microscopical examination of the blood in these cases is always of great help, even if malaria parasites are not found, as the polymorphonuclear leucocytosis of true appendicitis is often absent, though I must not omit to say there are several exceptions.

Pseudo-peritonitis.—A lady in Skopolje was supposed to be suffering from peritonitis due to some old uterine affection. She had low fever, pinched face, vomiting, severe pain and tenderness all over the abdomen. The spleen could not be felt, but palpation was difficult owing to rigidity of the muscles. The blood was examined by me and found to be teeming with malaria parasites. Quinine cured the condition in a few days.

Diseases of the Respiratory and Circulatory Systems.—I would call attention to certain manifestations of malaria affecting the bronchi, lungs, heart and vessels. If the chest is thoroughly examined at the very commencement of an ordinary malarial attack when the temperature just begins to rise, one will often notice a few dry râles, rather coarse; but the feature to which I should like to call attention is that, not rarely, especially at the pulmonary bases, very minute crepitations are heard, which may possibly be of pleural origin; they generally disappear when the temperature has reached its summit. They are quite different from the pseudo-crepitations one hears at times in patients who have been lying long in bed on their backs, as they do not disappear after a few inspirations. I have come across several cases, both in the Tropics and in the Balkans, of acute *dry bronchitis* of undoubtedly malarial origin often with very little or no fever. One such case had been treated for months with expectorants and potassium iodide without any result, while a few doses of quinine caused all the symptoms to disappear. Similarly, I have come across a few cases of dry pleurisy of malarial origin, and two cases of consolidation of the lung also of malarial origin, closely simulating lobar pneumonia. One of the patients was taken suddenly ill with a rigor and fever after a cold bath; severe pain on the left side, cough with expectoration, which became blood-stained on the evening of the second day; at the right base a tympanitic zone, which on the third day become somewhat dull; spleen just palpable. As the blood of the general circulation and the red cells in the expectoration contained numerous malaria parasites, quinine was given intramuscularly in large doses. The fever dropped on the fourth day. As regards the *circulatory system* I have observed three cases of angina pectoris syndrome, very severe, to be completely cured by quinine. *Peripheral arteritis* is not very rare. One of my native assistants in Ceylon had several attacks of a peculiar condition; his superficial temporal artery on the left side used to become very swollen, and at the same time very hard and knotty to the touch, and extremely painful on palpation. The attack at times came on without any fever, with parasites in the blood. Quinine in large doses generally caused the attack to subside within forty-eight hours. I have seen cases of arteritis of the lower extremities ending in gangrene and conditions resembling Raynaud's disease. This malarial gangrene has been ably investigated at Salonika by Falconer and Anderson. I have seen cases of what the French authors call "Claudication intermittente," which cleared up completely on quinine being given; also a case of erythromelalgia and acroparæsthesia due to the same cause. Of so-called functional affections of the heart I have seen cases of palpitation, tachycardia, arrhythmia, and one typical case of heart block, certainly of malarial origin. This case of heart block was in a middle-aged man; he had had several attacks—slow pulse, epileptic seizures, visible auricular impulses in the veins of the neck, 3 : 1 rhythm. He denied ever having had fever. His spleen, however, was slightly enlarged and very hard. The blood showed a few malaria parasites. A persistent quinine treatment freed him of his attacks.

Diseases of the Uro-genital Organs.—Cases of malarial nephritis have been described: in men a neuralgia of the testicles; in women a neuralgia of the ovaries of malarial origin is occasionally met with. Epididymitis and orchitis have also been described. I have seen a case in Macedonia. The patient, who was living in a very malarious district, but had never had attacks of fever, complained suddenly of severe pains in the testicles. When I saw him both testicles were swollen and very tender, but there were no signs of effusion; no gonorrhœa; temperature 101° F.; blood +. Quinine caused all the symptoms to disappear in three days. I have seen a very interesting case of *priapism* of malarial origin. Blood positive. The condition, which had not been influenced in the least by full doses of bromide, hot baths, belladonna, &c., disappeared on large doses of quinine being given.

Skin.—Various skin eruptions may be seen in malaria, but on the whole—apart from herpes—in my experience they are not very frequent. In acute cases the most frequent is herpes, of which the commonest type is herpes labialis, then herpes progenitalis, seldom herpes zoster. I have seen various cases of diffuse erythema and a few of urticaria of malarial origin, also a peculiar patchy œdematous condition which had been erroneously diagnosed as Calabar swelling and Quincke's œdema. I have seen a case of very severe scarlatiniform erythema of malarial origin, followed by desquamation in large flakes; also a typical case of erythema multiforme, and one of erythema nodosum. Cases of purpura I have already described.

Papular rashes are very rare. A young European in Ceylon was suddenly taken ill with high fever, vomiting, and extremely severe pains in the back. Two days after a papular eruption appeared; the papules were small and shotty, and very abundant on the face. The case was suspected to be one of incipient small-pox until, after repeated examinations, malaria parasites were found in the blood. Quinine cured the condition quickly.

Pigmentation.— Everyone is acquainted with the earth-coloured appearance of the skin in chronic cases; at other times the skin is pale yellow, greenish-yellow, or ashy-grey. Patches of hyperpigmentation (chloasma malaricum) are very common, and cases of diffuse pigmentation with great loss of flesh and severe asthenia, closely resembling Addison's disease, are occasionally met with.

Diagnosis, Prognosis, and Treatment of Malaria.

Before leaving the subject of malaria I should like to say a few words on the diagnosis, prognosis, and treatment of the malady.

Diagnosis.—To the young medical officers going to the Balkanic zone, I would give the following hints:—

(1) Whatever the type of fever and the symptoms of the case you

have been called in to see—even in presence of a syndrome pointing to an acute surgical condition—keep in mind the possibility of malaria.

(2) A negative blood examination is of no importance unless repeated with the same result very many times, and at different intervals.

(3) The fact of quinine not influencing the fever does not always exclude malaria.

(4) While attaching very great importance to laboratory methods—it is only by this means that a positive diagnosis can be made with absolute certainty—do not neglect the clinical examination of your patients. Train your senses as much as possible. The importance of simple inspection, the importance of simple palpation, can hardly be exaggerated. A slight abnormality of the colour and pigmentation of the patient's skin, easily overlooked by the inexperienced, may suggest to the tropical clinician a diagnosis of probability in an obscure case; and, acting on it, he may perhaps save the patient's life. And in how many cases may not the faintest feeling of the tip of the spleen—impalpable to less trained hands—put one on the right track in a difficult case.

Prognosis.—In the Balkans, as in any other malarial country, provided an appropriate quinine treatment be given, the prognosis is good in the enormous majority of cases. It must be remembered, however, that (1) in pernicious cases a high mortality may be present notwithstanding an energetic quinine treatment; (2) in a large number of cases, even of the usual benign type, the cure which is brought about by an appropriate treatment is merely clinical—that is, the patient feels well and shows no signs of the malady, except perhaps a persistent large mononuclear increase, but a complete sterilization is not obtained. The affection remains dormant for months and years, and any cause lowering the resisting power of the individual, such as chill or traumatism, may cause the acute symptoms to reappear. I have known the disease to recur in patients in England ten and fifteen years after leaving the Tropics. This, after all, is analogous to what one sees in certain other protozoal diseases — syphilis, for instance, yaws, and sleeping sickness. I have mentioned traumatism; an operation, for instance—the simplest operation may re-awaken a very old dormant malarial infection; the patient, shortly after the most simple surgical intervention, may have a rigor, the temperature rapidly rises to 104° or 105° F.; very severe vomiting sets in: symptoms which may cause a great deal of anxiety to the surgeon, who naturally may be very far from thinking of malaria.

Treatment.—In my experience the treatment of malaria in the Balkanic area, as in any other country, may be described in the one word—*quinine.* Only it must be given in very large doses, 30 to 60 gr. and even more, daily. The drug should be given by the mouth in ordinary cases, by intramuscular injection in serious cases; intravenously in the pernicious forms. In the many years I have practised in the Tropics, and during the last two years in the Balkans, I have given almost numberless injections of quinine without any bad results except a slight local infiltration at the place of injection. It is, of course, essential that the solution should be accurately prepared and sterilized; the simplest way is to use the ampoules each containing 15 gr. of hydr. of quinine, which should be obtained from a reputable firm. Of the enormous advantage of using intramuscular and intravenous injections of quinine in serious cases I have no doubt whatever; they are a means of saving life in many pernicious cases. I well remember a certain hospital in Serbia in which the mortality for pernicious malaria was practically 100 per cent.; this rate was reduced to less than 20 per cent. after injection treatment was introduced. While quinine, in my opinion, is the most powerful drug we possess for fighting malaria, and in a general way may be called a specific, it must be admitted that there are cases of malaria which respond very slowly or not at all to a simple quinine treatment. In such cases other drugs have been tried; of these I may mention picric acid, methylene blue, antimony, arsenic; and of arsenic both the old preparations—liq. arsenicalis, arsenious acid—and the more recent compounds such as atoxyl, salvarsan, galyl, &c. In my experience when given alone none of these drugs has any marked effect on malaria. When given, however, in association (sometimes alternately) with quinine, they are useful in certain cases and seem to increase the effect of the quinine. The efficacy of a combined quinine-arsenical treatment in certain forms of the malady has been recognized for many years, and has been extensively used in the Tropics. A combined method which has given me satisfactory results in certain cases in which quinine alone was acting very slowly is a combined quinine, phosphorus, and tartar emetic treatment. The patient takes daily a dose of the following quinine-tartar emetic mixture:—

Quin. sulph.	10 gr.
Ac. sulphur. dil.	10 minims
Tartar emetic	$\frac{1}{6}$ to $\frac{1}{4}$ gr.
Codein	$\frac{1}{6}$ gr.
Syr.	1 dr.
Aq. chlorof.	ad 1 oz.

t.d. or every four hours.

In addition to taking this mixture daily, the patient is given one day an intramuscular injection of quin. hyd. (15 gr.), and the next day a subcutaneous injection of 1 to 4 minims of phosphorated oil. This phosphorated oil should be of recent preparation, and may be diluted with sterile oil. The injection is made subcutaneously in the arm, just like an ordinary injection of morphia; at the time of the injection the patient feels no pain whatever, but after a few hours some pain may be felt which, however, is not very severe—much less so, for instance, than after an emetin injection. I have used phosphorated oil by subcutaneous injection for many years in the treatment of various diseases such as osteomalacia, rickets, leukæmia, &c., and I have never noticed any untoward symptom, provided, of course, the treatment is carried out with all due caution and care. Neither antimony nor phosphorated oil when given alone have any distinct effect on malaria; they seem to act as coadjuvants.

Prophylaxis.—I will limit myself to stating that, in my opinion, both methods of prophylaxis—the one based on anti-mosquito measures and the other based on the preventive administration of quinine—should always be used together. Exclusive reliance on the one or the other may be the cause of unsatisfactory results in practice. As regards anti-mosquito measures, the destruction of larvæ by oiling all pools and ponds near the camps, hospitals, &c., is by far the most useful; mechanical protection by means of mosquito nets, &c., should also be carried out. Chemical preparations to keep off mosquitoes are occasionally advantageous: the best is citronella oil; a more pleasant preparation to use is menthol powder, though less effective. As regards prophylaxis based on quinine administration, the usual dose of 5 gr. daily is utterly inadequate in the Balkans. The daily dose should be increased to at least 8 or 10 gr., and even these doses are at times insufficient to prevent infection.

TYPHUS EXANTHEMATICUS.

In reference to this malady, which according to certain observers has killed off nearly one tenth of the Serbian population during the years 1914-15, I would like to make a few remarks on the following points:—

(1) The rash.

(2) Course and duration of the malady: certain sequelæ and complications.

(3) Prophylaxis.

Rash.—Definite preliminary rashes are rare. What one generally sees is a very marked flushing of the face, neck, and upper portion of the chest, with a subcuticular mottling of the skin of the lower part of the chest and abdomen (cutis marmorata). This feature was present in about 80 per cent. of my cases during the second and third day of the malady. It should be noted at once that this symptom is far from being specific : it was extremely common, in fact almost constant, in the very numerous cases of pappataci fever I saw in the Skopolje district and other parts of Macedonia, as I shall mention later, and may be observed also in certain cases of relapsing fever and paratyphoid B. The true typhus rash appeared generally on the fourth or fifth day, in the form of small roseola spots, indistinguishable from typhoid roseola except that it was very much more abundant. It generally started on the abdomen and then spread to the chest, arms, and legs. Over the last two regions, however, it was rare, this being contrary to what one reads in text-books. The spots are at first all roseola-like and disappear on pressure, then some of the spots slowly fade away while others become of darker hue and do not disappear on pressure, but seldom become so dark bluish as in true purpuric conditions. According to my experience it must be admitted :—

(1) That the rash may remain purely roseola-like without any of the spots becoming petechial. It is then indistinguishable from enteric rash but for its profuseness in most cases. It should be noted, however, that certain cases of enteric may have a profuse rash : one such case in Skopolje turned out to be paratyphoid B, the patient being covered with a roseola.

(2) There are cases in which the rash is not only roseolar—and remains so—but is extremely scanty and may be altogether absent.

The newly arrived medical man should be on his guard not to mistake for typhus rash a petechial rash which I have called *Balkanic rash,* composed of innumerable, perfectly circular dark red petechiæ, which is extremely common in the Balkans in peasants and soldiers. I have many a time seen a patient taken to the typhus wards only because he had fever (often malaria) and this petechial rash which is merely due to the multiple bites of innumerable fleas. Anyone who has not been to the country can scarcely believe how profuse this rash can be: the whole body, with the exception perhaps of the face, is completely covered with it, while the shirt of the sufferer may be absolutely black from the numbers of living fleas upon it. With a little practice one soon learns easily to distinguish the two rashes : each flea-bite shows at first a central hæmorrhagic spot surrounded by a hyperæmic circular zone which disappears on pressure. This peripheral hyperæmic zone fades away spontaneously within a day or two, while the central hæmorrhagic spot remains as a "petechial" area which is as a rule perfectly circular, not raised, and of a dark red colour which does not disappear on pressure.

Course of the Malady. Complications and Sequelæ.—The disease begins generally suddenly with pains all over the body, a feeling of prostration and occasionally rigors; but cases in which the onset is slow, somewhat typhoid-like, are far from rare. On an average the duration of fever in my cases was from fourteen to eighteen days. In 80 per cent. of them the fever will not come down by crisis, as usually stated, but by lysis, lasting in general three to five days, and occasionally much longer. Relapses may occur, but are rare: only once have I seen re-infection (interval between the two attacks was four months). I would call attention to the frequent co-existence of typhus and relapsing fever. This is explained by the same insect (louse) carrying the two infections. The commonest complications and sequelæ I have observed were, in order of frequency, parotitis, often proceeding to suppuration, gangrene of the feet, polyarthritis, neuritis. Several cases developed during convalescence symptoms of severe depression almost amounting to melancholia.

As regards the prophylaxis of typhus, I am a believer in the efficacy of taking every possible measure against lice, especially the sterilization of all soldiers' underclothing and uniforms at fixed intervals, and frequent bathing. As regards the use of various substances to keep away lice from the body, most are in practice rather disappointing, but may be useful in certain cases. Dr. Thomas W. Jackson and myself carried out a number of experiments on the subject in Serbia in 1915 and come to the following conclusions[1]:—

(1) In regard to solid and liquid insecticides, the substances which we have found to be deleterious to body lice (*Pediculus corporis* de Geer 1778) are, in the order of their efficiency: (i) kerosene oil and benzene, (ii) plain vaseline, (iii) guaiacol, (iv) anise preparations, (v) iodoform, (vi) lysol, cyllin, and preparations of similar type, (vii) carbolic acid solution (5 per cent.), (viii) naphthalene, (ix) camphor. We found that pyrethrum had a very feeble action, while boric acid, sulphur, corrosive sublimate and zinc sulphate, when used in powder form, had apparently

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[1] See *Journ. Trop. Med.*, 1915, xviii, p. 253.

no action whatever. As regards bed-bugs, kerosene oil is the best insecticide. Next to it comes guaiacol.

(2) It is interesting to note that substances which are powerful licecides may have very little or no action on bed-bugs, and vice-versa. For instance iodoform, which kills lice in ten to fifteen minutes, has practically no deleterious action on bed-bugs, which may live for more than twenty-four hours when exposed to it. It has also very little effect on fleas. Pyrethrum, on the other hand, has a much more powerful action on bed-bugs than on lice. It may be useful, therefore, in preparing insecticide powder for general use, to mix various substances, some deleterious to lice, others to bed-bugs, and so on.

(3) For use against lice on a large scale as among troops or prisoners, perhaps the best insecticide powder is naphthalene. This substance has a lower licecide action than kerosene oil, guaiacol, iodoform, and anise preparations, such as anethol, but it has a less unpleasant odour than the first three named and is much cheaper than anethol powder. In stored blankets and clothing it is also practicable and of use, as frequently lice are found upon the clothing and blankets stored through the summer. Naphthalene is useful for its well known deterrent action upon moths. We are speaking here of insecticide powders. As regards liquid insecticides the American Sanitary Commission sanctioned the use of kerosene by using it daily for troops and prisoners.

(4) For the better class of patients in practice a menthol powder (menthol 3 to 5 gr., zinc ox. 1 oz.) is to be preferred to naphthalene in most cases, as its odour is not unpleasant, while it is repellent to mosquitoes, in addition to lice and fleas. Such powder is especially useful in summer and in hot countries, as it has a cooling effect on the skin and often prevents prickly heat.

(5) As regards the use of ointments, plain vaseline is a powerful licecide, and it is doubtful whether the addition of white precipitate, &c., increases its action. In practice, however, it is useful to add a small amount of white precipitate (3 gr. to 1 oz.) as it has a beneficial effect on secondary pyogenic infection so common in people harbouring lice.

RELAPSING FEVER.

Relapsing fever was extremely common in Serbia in 1915, in the spring and summer especially. It was not rare in 1916 among the Serbian troops in Corfu, after the retreat through Albania, and cases have been seen by me again in the Balkans this past winter. I would call attention to the comparative frequency of mixed infections which were seen in 1915: typhus exanthematicus + relapsing fever; malaria + relapsing fever. In Skopolje in 1915 it was extremely common to see relapsing fever developing in convalescents from typhus. The frequent coexistence of the two infections is probably explainable from their being carried by the same insect, the louse; though personally I am inclined to believe that relapsing fever is carried also by bed-bugs. As regards the ætiology of the disease, as I hope to demonstrate in a future publication, I believe that—as is the case in Africa, America, and Asia—it is also due in Europe to several species of spirochætes and not to one only (*Spirochæta recurrentis*, Obermeyer). As regards clinical symptoms I would point out how extremely difficult it is to diagnose from purely clinical symptoms at the onset of the first attack, relapsing fever from typhus, malaria, and pappataci fever. The different diagnosis will be discussed later.

I would call attention to two skin features I have noted: the so-called *cutis marmorata*, and flushing of the face, very frequent, and occasionally a very fine rash composed of very small roundish delicate pinkish or red roseola spots on chest, abdomen, and trunk, even in cases in which a mixed infection with typhus exanthematicus or enteric could be excluded with certainty, as the fever dropped on the fifth or sixth day.

On the whole, though relapsing fever is certainly a serious disease, it is not very dangerous, and the mortality is low—in Serbia less than 3 per cent.

In the treatment of the malady I have found salvarsan, neosalvarsan and galyl, to be fairly efficacious when given intravenously in 0·3 grm. doses, but there are a certain number of cases in which the results are disappointing. I have found it useful to associate tartar emetic with salvarsan. I give it intravenously, using the usual 2 per cent. solution (4 to 8 c.c.) or the following formula:—

Tartar emetic	4 grm.
Sol. ac. carbol., 1 per cent.	100 c.c.

Half to 2 c.c. is diluted at the time of injection with sufficient sterile saline to bring it to 5 c.c., and the whole injected into a vein, taking the usual precautions.

In conjunction with the intravenous administration, I have given it in certain cases also by intramuscular injection (special formulæ to be mentioned later on in connexion with kala-azar) and by the mouth in the form of my yaws mixture, which contains tartar emetic, potass. iodid.

sod. salyc. and sod. bic. Care should be taken to stop the drug during the crisis, or unpleasant symptoms of collapse may appear. The drug seems to have a beneficial action, but given alone seldom cuts short the first attack of fever, though in a certain number of cases apparently it prevents relapses. On the whole a mixed salvarsan-tartar emetic treatment is the best.

PAPPATACI FEVER.

This fever is extremely common in summer all over the Balkanic and the Adriatic zone. The so-called Uskub or Skopolje fever, epidemics of which occur regularly every year in Skopolje and surrounding Macedonian districts, I found out in 1915 to be also pappataci fever. The disease, but for the rash, is very similar to dengue as I have seen it in the Far East and Ceylon. It begins suddenly with rheumatoid pains all over the body, headache, pains in the eyeballs, fever (which seldom goes higher than 104° F.) ; no rigors. The face is flushed and has often the appearance of being slightly bloated. The flushing is often so marked and severe as to amount to an erythematous rash, which often involves the neck. I would call attention to the appearance of the skin of the chest and at times of the abdomen, which shows frequently a delicate subcuticular mottling—*cutis marmorata.* The fever keeps high (102° to 104° F.) for thirty-four to forty-eight hours; it drops by crisis on the third day. Occasionally the fever lasts for four or five days, and may not drop so suddenly. At times some superficial lymphatic glands are enlarged.

I should like to make a few remarks on the following points: (1) The erythematous flushing of the face and neck and the appearance of the fauces. (2) Differential diagnosis between pappataci fever and typhus at onset.

(1) A feature of the well-known erythematous flushing of the face and neck has apparently escaped previous observers; this flushing is persistent, that is to say it lasts long after the fever is over—eight, ten, twelve, and even fifteen days—fading away very slowly. In the Skopolje wards it was not difficult to distinguish, among the convalescents from various diseases, those who had had pappataci fever, from this peculiar sign. As regards the appearance of the fauces, not only is there the usual congestion of tonsils and pharynx common to most acute fevers, but the mucosa of the soft palate presents a peculiar appearance—numerous small hyperæmic roundish spots, the eruption being sharply limited by a line of demarcation between the soft and hard palate. This appearance of the soft palate is not, of course,

peculiar to pappataci fever, for it may be found, for instance, in cases of relapsing fever and typhus exanthematicus, and in certain cases of malaria; it is rare however in typhoid. This appearance of the soft palate often persists for several days after the fever is over, in the same way as the flushing of the face.

Diagnosis between Pappataci Fever and Incipient Typhus.—When in the Balkans a patient is admitted into hospital with high fever, flushing of the face, subcuticular mottling of the chest and abdomen, it is most difficult to make a diagnosis between incipient typhus and pappataci fever, though to make such a diagnosis is of great practical importance. Great help is given by examining the blood: in pappataci fever leucopænia is always present, in typhus leucocytosis, or, at any rate, no leucopænia. When there is an epidemic of the two diseases, and there are hundreds of patients admitted daily, there is no time to count the leucocytes with a hæmocytometer; a rapid examination of a stained film, especially at the edges, generally enables the experienced observer to come to a conclusion at once as to whether there is leucocytosis or leucopænia. I have found this procedure extremely useful in many a doubtful case.

DENGUE.

According to certain observers there have been quite a number of cases of dengue in Salonika, Gallipoli, and Macedonia. The cases which have been shown to me in Serbia and Macedonia were all pappataci fever, but there has been dengue in Gallipoli. Dengue cannot be distinguished from pappataci fever the first two days, as the symptoms of the two diseases are identical, including the leucopænia. On the third day the fever generally abates in both maladies, but whereas in pappataci fever the temperature often remains normal—though there are many exceptions—in dengue very often there is again slight fever, though not so high on the fourth, fifth, and occasionally also on the sixth day, and the patient during these days again feels ill. Moreover, when the temperature falls on the third day, the typical roseola or erythematous rash of dengue appears (during the crisis or shortly afterwards).

Though I have not myself seen dengue in the Balkans, I have seen almost innumerable cases of it in Ceylon and the Far East. I should like to call attention to one or two clinical points which have apparently been overlooked by some writers on the subject:—

(1) The condition of the superficial lymphatic glands.

(2) Relapses.

Superficial Lymphatic Glands.—In most of the text-books I am acquainted with, it is definitely stated that the lymphatic glands are never enlarged in dengue. In my experience, the enlargement of some lymphatic glands—cervical, axillary, &c.—is comparatively frequent, varying from 30 to 70 per cent. of the cases I have seen, and may be considered to be one of the common features of the disease. The glands most frequently affected are the cervical, then the axillary, then the inguinal, &c. The glands may occasionally be tender on pressure and may remain enlarged for some days, at times weeks, after the fever is over. The gland juice, aspirated with a sterile syringe and injected in healthy individuals will reproduce the disease (two positive cases out of three).

Relapses.—Relapses and reinfections are generally considered never to occur, or to be at least extremely rare, in dengue, but in my experience they are far from being so. I have known several individuals in Ceylon get a typical dengue attack, with rash, &c., in three consecutive years. A member of my own family had an attack of dengue in Colombo in November, 1913, another in February, 1914, and again in October of the same year. Every time the attack was typical and the rash was present.

Sequelæ.—I should like to say a few words about a sequela which is very distressing and very difficult to cure—polyarthritis, with swelling of various joints, either the small ones or the large ones, or both. The condition in certain cases, but for the fact that it develops after a typical attack of dengue, may be indistinguishable, clinically, from polyarthritis of rheumatic origin. Salicylates and iodides are useless, and the treatment is symptomatic; opiates have often to be used to allay the severe pains. This sequela in its severe type is, fortunately, comparatively rare, considering the very large number of cases of dengue occurring during an epidemic, but it is most distressing, being so little influenced by treatment. It may last from two to three months and sometimes a much longer time. A change of climate is often beneficial.

OTHER TROPICAL DISEASES.

As the time is getting short I propose to omit relating *in extenso* the observations I have made on the other tropical diseases found in the Balkans, and will limit myself to the following very brief *résumé*:—

(1) Numerous tropical diseases are found in the Balkanic zone.

(2) Malaria is the most common and important of these diseases.

(3) Next to malaria the diarrhœas and dysenteries are the most common affections. The majority of cases of dysentery are of bacterial origin, but very numerous cases of the amœbic type are also seen. Cases of enteritis due to flagellates and, rarely, to ciliates, occur. Coccidiosis has been observed. Cholera and paracholera have been rare. Attention should be called to a peculiar choleraic type of bacterial dysentery; also to a type of diarrhœa seen in Serbian soldiers who had suffered terribly from starvation during the Albanian retreat. This diarrhœa closely resembled the famine diarrhœa observed in India by officers of the Indian Medical Service.

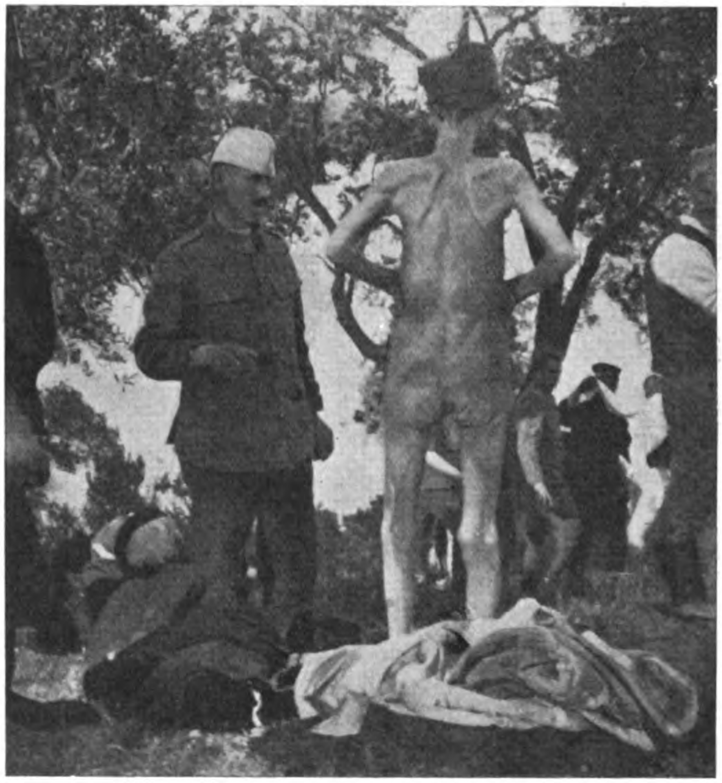

FIG. 5.

A case of "famine diarrhœa" in a starved Serbian soldier after the Albanian retreat.

(4) *Camp jaundice (icterus castrensis)* is common. According to my experience two varieties can be distinguished: (1) A very severe type, hæmorrhagic, with high fever lasting ten to twelve days, showing occasionally a relapse—true Weil's disease, or icterus castrensis gravis,

rare; (2) a mild type, icterus castrensis levis, often afebrile, very common. Weil's disease, as is well known, is of spirochætic origin, but in my opinion it is probable that many cases of the mild type are also spirochætic. Owing to the almost complete lack of guinea-pigs the study of spirochætic jaundice is difficult in the Balkans. In my experience, however, the simple microscopic examination (Indian ink method, Giemsa staining) of urine, repeatedly centrifugalized, will, however, occasionally reveal spirochætes two or three weeks after the onset of the malady, and also in certain cases of a peculiar type of purpura without jaundice. In addition to true camp jaundice one comes across cases of jaundice of malarial origin, paratyphoid origin, streptococcal origin, &c., nor should one forget the icteric type of relapsing fever.

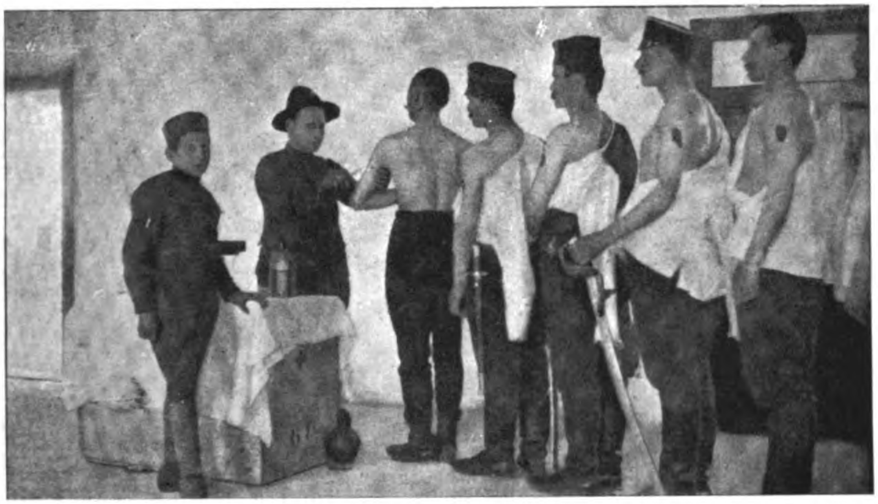

FIG. 6.

Vaccination of Serbian troops with tetravaccine (T.A.B.C.) by an American Red Cross doctor.

(5) Fevers of the enteric group are fairly frequent in the Balkans, but during the last year have never assumed an epidemic type. Paratyphoid A and B are in certain districts more frequently met with than true typhoid. Paratyphoid and similar fevers due to intermediate germs are not rare. Lurie and myself have found cases due to *Bacillus columbensis*. Attention should be called to the somewhat frequent occurrence of mixed infections such as "typhoid-paratyphoid A," or "typhoid-paratyphoid B," or "paratyphoid A-paratyphoid B." I have

observed two cases of triple infection: "Typhoid-paratyphoid A-paratyphoid B"; diagnosis based on hæmocultures. In regard to the prophylaxis, the method of combined vaccination I devised many years ago and have used on a large scale ever since, has given good results. It has recently been adopted in all the allied armies, thanks especially to the efforts of Dreyer, Walker, Rho, Bassett-Smith, Conte and others.

(6) Of Malta fever I have seen only two cases in Macedonia and the interior of the Balkanic zone; it is more frequently met with on the coast and in the islands.

(7) Kala-azar of adults I have never seen in the Balkans; of the infantile type I have observed many cases in certain islands of the Adriatic and Ægean seas. It is rare in Macedonia, where I have seen only one case.

(8) Relapsing fever is quite common. In the treatment of the malady I have obtained the best results by using a combined salvarsan-tartar emetic treatment.

(9) Typhus exanthematicus is at the present moment very rare, whereas a terrible epidemic raged in 1914-15. Trench fever is occasionally met with; both of the types described in France have been met with also in the Balkans.

(10) Pappataci fever is extremely common in certain parts of the Balkans, especially so in the late summer and early autumn.

(11) *Bronchomycosis* and *Bronchospirochætosis* are observed.

(12) Pellagra is quite common in several districts of Macedonia, but I do not think there is any danger for our troops. I have seen a case of leprosy and a typical case of venereal granuloma.

(13) Of the tropical diseases which are of rarer occurrence, I may mention blackwater fever, filariasis, sprue, intestinal myiasis, mycotic, spirochætic, and flagellate urethritis.

(14) Certain tropical skin diseases are frequently met with. The following are a cause of great discomfort in summer and are often wrongly diagnosed: dermatitis interdigitalis epidermophytica, or "mango-toe"; tinea cruris, or "dhobie itch"; prickly heat; various types of tropical pyosis—such as pyosis Mansoni, pyosis discoides, &c. I have seen in 1915, in Macedonian peasants, cases of ulcus tropicum oriental sore, ulcus infantum, blastomycosis, sporotrichosis, accladosis &c. I have seen numerous cases of trichomycosis axillaris flava, nigra et rubra, of intertrigo saccharomycetica, and various other hypho mycetic affections. I have observed two cases of Madura foot; tw of keratoma plantare sulcatum, and one, typical, of *ainhum*.

Section of Neurology.

President—Professor W. D. HALLIBURTON, M.D., F.R.S.

(*October* 26, 1916.)

PRESIDENTIAL ADDRESS.

The Possible Functions of the Cerebrospinal Fluid.

By W. D. HALLIBURTON, M.D., F.R.S.

So much has been written within recent years about the cerebrospinal fluid that I must apologize for my want of originality in selecting that subject for this address. But however hackneyed the subject, we are still far from possessing complete knowledge as to the functions and significance of the fluid. From the pathological as well as from the physiological point of view, we at least know that this remarkable fluid is one of the greatest importance, and its careful examination in many diseases has yielded results of inestimable value. During the last few years it is a subject at which I have myself worked, and I have been fortunate in securing as my collaborator such a skilful and accurate experimenter as my colleague Professor W. E. Dixon.

One cannot work at any subject for any length of time without speculating beyond actually observed data. It is the safest rule to keep ideas of this nature to oneself, but there are some occasions when it is permissible to speak rather more freely; this is one of them. I happen to be the unworthy occupant of a presidential chair, and for an hour or less I shall be free from contradiction and criticism, so I propose to inflict upon you during that time some speculations, and have only safeguarded myself in the title of this address by alluding to the functions of the fluid as possible rather than probable. As my colleague Dixon is away on War Service, I have had no opportunity of discussing the matter with him, so that if I say anything that is wildly improbable he at any rate is free from responsibility

I shall dwell on the subject from the physiological rather than from the pathological standpoint, but I trust that what I have to say will be found of interest to the pathologist and the clinical observer.

May I, after this preface, proceed to another chapter, which is also of a prefatory character, and state as shortly as I can the present state of our knowledge regarding the characters, composition and fate of the fluid. The fluid, as you know is, under normal conditions, as clear as water and of low specific gravity; it contains in solution inorganic salts similar to those in the blood-plasma, a trace of coagulable protein, and a certain amount of a reducing substance which has now been definitely proved to be glucose; it is practically free from formed elements. Under various abnormal conditions the protein matter may be largely increased, or substances other than the usual ones may be added to it, such as cholesterol and choline (or a choline-like substance). It may further have added to it various kinds of cellular structures, the differentiation of which is a valuable aid in diagnosis, and in other cases parasites of different kinds may be found. The fluid is primarily formed by the secreting cells which are most prominently found covering the choroid plexuses in the cerebral ventricles, so that this structure may be appropriately designated, as Mott first suggested, the choroid gland. The fluid is normally present at a certain pressure, and this pressure is not the result of arterial pressure passively transmitted to the fluid. The cerebrospinal pressure, it is true, may be affected by changes in the arterial and venous pressures, but it is not dependent on them; and it may and often does vary quite independently of these. The true cerebrospinal pressure is the result of the secretory pressure of the choroid epithelium cells. In other words, the craniospinal contents cannot any longer be regarded as a fixed quantity without the power of expanding or contracting in volume.

The rate of flow and the pressure of the fluid can be readily investigated in animals by placing a cannula in the subcerebellar cisterna and connecting it with the necessary apparatus. It is then found that there are three groups of substances which promote the flow and increase the pressure independently of those which affect it secondarily by altering the blood-pressure. The first group consists of excess of carbon dioxide (or lack of oxygen) in the blood, as in asphyxia, and drugs which interfere with respiration. The second group is that of the volatile anæsthetics, which may act by interfering with the respiration or by altering the physical conditions of secretion. The third group is specific, and consists of an extract of the choroid gland, or of the brain. The former is the more powerful. The chemical nature of the hormone in this extract is uncertain, but it is probably some product of nerve metabolism, which, arising in the brain, passes to the choroid plexuses, accumulates there, and stimulates the secreting cells to activity; it cannot be discovered in the normal secretion, but in cases of general paralysis and brain softening—conditions in which catabolic processes are excessive—it can be recognized (by physiological tests) in the fluid itself. The choroid plexuses are abundantly provided with nerves, but there is no evidence that these are secretory in nature; indeed the evidence derived from experiments with atropine and similar alkaloids points in the opposite direction. The hormone, whatever its nature, acts probably, not on nerves, but on the secreting cells directly.

There is no doubt that this fluid is being continually formed, and the next question is—What becomes of it? Large quantities of a neutral fluid, such as physiological saline solution, disappear within a few minutes when introduced into the craniovertebral cavity, and the course taken by such fluids, and presumably also of the normal cerebrospinal fluid, can be traced by adding some substance which can be easily recognized by its colour, or by chemical tests, or by its physiological action. Using such methods it has been demonstrated that the exit is by the blood-stream, and not by the lymph channels of the nerves, which was formerly thought to be the case by a number of French observers.

If such substances are readily diffusible the speed with which they appear in the blood is very remarkable, especially if they are introduced into the subcerebellar region. An injection, for instance, of adrenaline, nicotine, or atropine produces typical physiological actions within a few seconds, in fact, almost as rapidly as if the injection had been made into the venous circulation direct.

On the other hand, substances which are not readily diffusible (such as commercial peptone) do not produce their characteristic effects when they are introduced into the cerebrospinal fluid, so that one of the older theories that actual valved orifices exist leading into the large veins at the base of the brain must be abandoned.

The diffusion process is most rapid in the subcerebellar district, but is extremely slow in the spinal, especially the lower spinal region.[1] The fluid probably reaches the venous sinuses by the microscopic arachnoid villi described by Weed. There is also a possibility that in addition to this, transference may take place through the thin walls of the blood-vessels within the central nervous system, for, as Mott has pointed out, contact of these vessels with the cerebrospinal fluid is maintained throughout their extent by the perivascular spaces which are continuous with the subarachnoid cavity. Diffusion in the opposite direction from blood to cerebrospinal fluid does not occur except in an almost negligible degree in the case of a few drugs, such as alcohol and urethane.

But in addition to this there is another and minor communication between the fluid and the other parts of the body. Dixon and I found that dyes added to the fluid travel along the course of certain cranial nerves, and this is especially true for the olfactory nerve. This is not the case for the spinal nerves; no dye can be detected in their sheaths outside the spinal canal, and no dye is discernible in the lymph of the thoracic duct. I have spoken of this cranial (olfactory) outlet as a minor one, but clinical experience has shown that it is not a negligible one. For this loophole affords an opportunity for the entry of infective agents, as Flexner has shown in the causation of infective poliomyelitis.

Such then is a brief and I fear imperfect summary of the present state of our knowledge, and I propose now to pass to the main object of my address, which is to discuss the meaning and functions of the cerebrospinal fluid.

In the first place it can hardly be doubted that the presence of fluid within and around the structures of the central nervous system fulfils certain mechanical functions of support and pressure. That, however, does not explain why ordinary lymph would not do just as well, as it does in the majority of other organs. The relationships, however, of the brain and cord within a closed cavity are peculiar, and it may be that ordinary lymph is here insufficient to maintain a more or less constant pressure. For the pressure of ordinary lymph is wholly dependent on blood-pressure; here, in addition, we have an independent pressure, namely, the secretory pressure of the choroidal secreting cells, and it is therefore quite possible that this may come into play in maintaining, equalizing, and adjusting those pressure relationships which are most advantageous for the well-being and function of the brain and cord. It is further quite possible that the ameliorative effects not infrequently noticed as a result of withdrawal of the cerebrospinal fluid by lumbar puncture may be due to the relief of undue pressure. But such considerations offer no explanation of the peculiar composition of the fluid. Its characteristic chemical composition must have a deeper meaning.

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[1] This is tacitly accepted by those who produce spinal anæsthesia by the injection intrathecally of substances of the cocaine group, for they recognize the danger of absorption if the drug reaches the medullary region.

It is very common to speak of the cerebrospinal fluid as the lymph of the brain. Let us now examine this phrase more fully, and see if it has any scientific accuracy.

First of all we must be quite clear as to what lymph is, and what it does. It is a fluid which exudes through the thin walls of the blood capillaries. Whether lymph formation depends solely on physical conditions (filtration and osmosis), or whether in addition we have as a factor a secretory activity of the vascular lining membrane is an interesting physiological problem, which need not concern us now. The leakage fluid resembles blood-plasma in its composition, except that it is comparatively poor in protein material, the diffusion of which through membranes is so difficult. This lymph, when formed, acts as the intermediary or middle-man between the blood and the tissue elements, conveying to the tissue elements on the one hand the oxygen and nutritive substances they need; and on the other hand it is into the lymph primarily that the tissues pour the waste products of their activity, and thus these are started on their journey to the organs of excretion (lungs, kidneys, &c.). The very essence of a lymph is that it should be in free communication with the blood-stream, except for an intervening membrane, and that this membrane should be equally permeable to water and other substances in both directions. The arrangement of the perivascular and perineuronal spaces, filled as they are with cerebrospinal fluid, certainly resembles that of a lymphatic system, and therefore it is not surprising that the idea has been accepted that cerebrospinal fluid plays the rôle of lymph in the central nervous system. The peripheral nerves have a true lymphatic system analogous to that found in other organs, but anatomists are far from unanimous on the question as to whether the central nervous system possesses real lymphatic channels apart from the system of intercommunicating spaces occupied by cerebrospinal fluid. The mere difficulty of discovering true lymph-vessels does not indeed finally negative their existence, but until they are satisfactorily demonstrated we may provisionally assume that they are absent. If, then, cerebrospinal fluid is the only fluid which actually comes into contact with the tissue elements of the brain and cord, it necessarily follows that it must play the part assumed by lymph in other districts of the body; it must be for example the intermediary medium which is traversed by the oxygen on its way from blood to the tissue elements; and oxygen we know is essential for the continuance of nervous life and energy. Furthermore it must be the vehicle by which other nutriment reaches the cells and fibres of nervous tissue. The next point is, have we any evidence that the products of nerve katabolism pass into the fluid from the tissue elements as they do into ordinary lymph? If it were only possible to analyse and compare the composition of the fluid before it enters the perineuronal spaces, and after it leaves them, this question could be answered authoritatively, but in the absence of such proof one can only argue from probabilities. Seeing that the fluid is the only one available for the purpose, an affirmative answer seems inevitable, and this is supported by the fact that cerebrospinal fluid is rich at any rate in one waste product — namely, carbon dioxide.

The expression "lymph of the brain" is therefore so far justifiable. But we have absolutely no proof that the cerebrospinal fluid is in part an exudation from the blood, and it is in the origin of the fluid that the analogy between lymph and cerebrospinal fluid breaks down. Whatever views we may hold as to whether a secretory factor comes into play in the production of ordinary lymph (and, at the best, such a factor can only be an insignificant one), we can have no hesitation in proclaiming that cerebrospinal fluid is a true secretion arising in a definite glandular structure. Such a fluid must obviously be the best for maintaining normal life in the nerve cells, and the whole lining membrane of the spaces in which it resides appears to co-operate with the choroid gland in maintaining its constancy of composition, and to militate against the escape into it of substances from the blood-stream, such as drugs or poisons which would be foreign to the fluid or harmful to the delicate and sensitive structures which it bathes.

We have seen that the essential feature of a true lymph is the free interchange between it and the blood in both directions. This essential character is lacking in the cerebrospinal fluid; in all probability the lining membrane of the cerebrospinal spaces is permeable to substances passing from it into the blood, but it appears to be impermeable (except for oxygen) in the direction from the blood to the fluid. The nutritive materials the fluid contains appear to be formed in the choroid gland, and not to be merely exuded from the blood-stream; otherwise one cannot explain why the protein it contains is not similar to that in the blood or in exudations (lymph) formed from the blood.

If, as Weed has suggested, cerebrospinal fluid is partly formed, as is ordinary lymph, by exudation from the blood in the perivascular spaces, it is difficult to understand why readily diffusible drugs and poisons do not escape easily into the cerebrospinal fluid as they do into ordinary lymph. The difficulty is quite intelligible when we regard the choroidal epithelium as a stalwart barrier of cells which keeps back these materials, and only allows its own normal secretion to escape. This useful work would be undermined and frustrated if the general lining were easily permeable to foreign substances.

Camus found that barium chloride, which is a very active poison to the central nervous system, will kill a rabbit of 2 kgr. weight when $\frac{1}{10}$ mgr. is introduced into the subarachnoid space, whereas the lethal dose is one thousand times greater when this salt is given subcutaneously. It is well known that anaphylaxis can be produced by smaller doses of proteins introduced into the brain than when given elsewhere. The use of salvarsan in locomotor ataxy and similar late syphilitic affections *via* the cerebrospinal fluid has been abandoned, as it is fatal not only to the syphilitic organisms, but also to the patient. It is further known that salvarsan and its homologues are of little or no use in tabes and general paralysis when given by the ordinary channels, for in these later manifestations of syphilis the baneful spirochæte has got into a harbour of refuge (which we may speak of as extravascular) beyond the reach of the poison. The stalwart epithelial layer lets none escape, and does not realize how much both doctor and patient would rejoice, if it could be made to understand that in this instance at least it did not form such an effective barrier.

May I add by way of parenthesis how very desirable it is that chemists and pharmacologists should apply themselves to the solution of this difficulty. The future treatment of tabes and allied conditions should aim at the discovery of some blander arsenic compound which could be introduced straight into the cerebrospinal fluid and kill the syphilitic organism in its lair without at the same time slaying the host who harbours it.

Is not the very simplicity of the normal fluid suggestive? I remember when I was a student that normal or physiological saline solution was regarded as a physiological fetish, for surgeons continued to use sponges (usually dirty ones at that time) soaked in water during operations. What a change has now come over the spirit of their dream! They have realized that water, even clean water, is a protoplasmic poison, and that osmosis is a real force and not a negligible phenomenon. About the same time I remember witnessing, and in a humble measure assisting, Dr. Sydney Ringer in his epoch-making work on the effects of saline mixtures on living structures. The attitude of the profession generally in those days was a tolerant one, just the sort of attitude adopted by a grandfather indulgently watching his descendants playing with their toys. But who has not heard of Ringer's solution to-day? Who can write a paper on almost any physiological or pathological subject without mentioning it or alluding to the part it has played in his investigations?

Ringer's fluid is the ideal physiological salt solution; its saline constituents are present in the same proportion as they occur in the natural body fluids, and in that way the normal osmotic pressure is maintained when living structures are placed in it. Ringer's original solution resembled frog's blood in its saline composition, but since then several modifications have been introduced. The most important of these is that which we owe to Locke, who has altered the proportion of the various salts (increasing, for example, the amount of sodium chloride from 0·6 to 0·9 per cent.), so that the fluid may be employed with success on the living tissues of the mammal. Locke has also added a small proportion of the sugar glucose, and when in use it is kept saturated with oxygen. It is well known that in such a fluid living structures can be preserved in a living condition for hours, or even days and weeks. Locke's most striking results have been obtained with the mammalian heart; this can be kept beating for prolonged periods after its complete isolation from the body if it is perfused with the oxygenated fluid. The salts supply the normal stimulus to the cardiac fibres and maintain their physical integrity; the sugar acts as a source of energy and is consumed as activity continues.

Ringer's fluid, so compounded in the laboratory, is somewhat more than thirty years old. But in reality it is as old as the hills, or rather as man himself. Just as the Venus of Milo existed potentially from past ages in the block of marble from which it was ultimately hewn, so does Ringer's fluid exist in the blood and lymph, although its simple composition is obscured there by admixture with the blood proteins and corpuscles.

Here may I introduce another parenthesis and allude to another physiological puzzle, and that is the significance of the large amount of protein in the blood-plasma and lymph. The meaning and use of the blood corpuscles we understand, or at least we think we do, but the meaning of so large a quantity of protein in the blood fluid and the part it plays in nutrition is still hidden from us. The amount of protein necessary for the repair of the tissues is not great, and the modern doctrine of maintenance and growth is that the tissues help themselves, not from proteins directly, but from the various amino-acids which are the result of protein cleavage. The great protein store may be another instance of the prodigality of Nature in providing a large margin for conditions of weakness and stress. However this may be, the presence of protein is not necessary, or it may even be harmful when it is added to Ringer's or Locke's solutions in experiments with perfused organs.

But to resume the thread of our argument. Thanks to Ringer some thirty years ago, physiologists were provided with a suitable fluid for experimental work, but the choroidal epithelium knew the secret of extracting it from the blood for untold ages before Ringer was born. For what after all is cerebrospinal fluid but Locke's modification of Ringer's fluid?

The view I have been led to take is—the nervous mechanism being so sensitive, so easily influenced by anything unusual—that therefore the neurons must be bathed in an ideal physiological saline solution to maintain their osmotic equilibrium; the trace of protein it contains is probably quite sufficient for nutritive processes, and is no doubt the kind of protein particularly suited to repair the small amount of wear and tear which is the result of nervous action. The sugar, just as in Locke's solution, would serve for a supply of energy. The choroidal epithelium, in its wise choice of a suitable circumambient medium for the neurons, is really exercising a protective function. In order to keep out harmful proteins (toxins and the like), the comparatively harmless ones are kept back also, almost completely; all share the same process of exclusion. This protective action applies in addition to the majority of soluble drugs; this, as we have seen, may operate so as to be detrimental in diseased conditions. But we can hardly expect discrimination on the part of the epithelial secreting cells. The non-access of metallic and other poisons to the nervous elements is such a *sine quâ non* for their health, that during those periods when such substances are given for the relief of disease, or the slaughtering of parasites, the choroidal cells are unable to change their habits and therefore the drugs do not get through.

Such I believe then is the real significance of the simple composition of this remarkable secretion. But before I sit down I must allude, in conclusion, to some other possible additional functions which the fluid may exercise.

The late Dr. Gaskell approached the question from the embryological and developmental point of view; he held that the neural tube represents an ancestral digestive canal, and those who adopt Gaskell's hypothesis might conceivably argue that the cerebrospinal fluid is the representative of a primitive digestive juice, and is secreted by an organ which was formerly a digestive gland. However interesting such speculations may be, one can hardly suppose that anyone could seriously urge that the cerebrospinal fluid retains any such functions to-day.

Dendy is one of many comparative anatomists who have not accepted Gaskell's views, and he has suggested that the important function fulfilled by the choroid plexuses is that of an intracerebral gill, and is concerned in respiration. The structure of the plexuses is certainly gill-like, but it is always unwise to argue from mere anatomical resemblances. Mott, who analysed the gases of cerebrospinal fluid, found the quantity of carbon dioxide there very high (about 60 per cent.), and there is, therefore, something to be said in favour of the respiration hypothesis. It is quite possible that the choroidal epithelium may allow the escape of or even actively excrete this katabolic product, and it is unnecessary to point out how severe a poison any undue accumulation of carbon dioxide is in the central nervous system. Coupled with this fact is another I have previously mentioned—namely, that carbon dioxide is one of the most potent means of promoting a flow of the fluid. Just as urea is the best diuretic, and bile the best cholagogue, so carbon dioxide is one of the most powerful cerebral lymphagogues.

One further point and I have done. The ependyma is lined by ciliated epithelium. Some doubt exists, I believe, as to whether the cilia are functionally active. But if we admit they are, the question arises—In which direction do they act? This is a question which is hardly susceptible of actual observation in man or the higher animals, but in the Amnocœtes, which Professor Dendy has so largely used in his investigation, he has brought forward evidence which shows that the movement is in a forward direction. I know it is not always wise to draw conclusions from such lowly animals, and apply them without reserve to the higher ones. There are certain cases where such deductions are quite impossible, for instance, in some of the humble fishes the central canal of the spinal cord does not terminate blindly at its posterior extremity, but opens out by an orifice into the surrounding tissues.

In this case one can only speculate, and the rapidity of absorption of the fluid in the forward regions in comparison with that in the spinal district appears to favour Dendy's surmise. The cilia, if they are active, would no doubt promote the flow of fluid from the cord region to the large veins at the base of the brain, where it so readily leaves the subarachnoid space by entering the venous blood-stream.

There are doubtless other problems in connexion with the cerebrospinal fluid that demand solution, but my task for this evening is over. My main object has been to present the thesis in which I feel there is, at any rate, some truth—namely, that of regarding the cerebrospinal fluid as the perfect physiological medium, more perfect doubtless than the artificial fluids we can make in the laboratory, but in its essential features closely resembling those associated with the names of Ringer and Locke.

I think already I have said "finally," or "in conclusion," more than once, but you will pardon me if, like the proverbial writer of sermons, I say it a third time, and these are really my concluding sentences. These are days of specialization, but however necessary specialization in medical science may be it has its attendant evils. Particularly regrettable is the divorce between those who pursue their investigations by the bedside and those who work in the laboratory. Neurology, specially, is a branch of our science in which an attempt should be made to bring about a closer *rapprochement* between the two sets of workers. Speaking personally I have derived inestimable benefit from meeting pathologists and hearing here the clinical side of the subject. Those responsible for the management of this Section of the Royal Society of Medicine have realized this, and in having elected this year a President who is a laboratory person they have shown that they see the value of the *entente* to which I have alluded; and I can only trust that my year of office may not be detrimental to those who form the larger contingent in the Section—namely, those who pursue more particularly the study of disease by the bedside.

Section of Neurology.

President—Professor W. D. HALLIBURTON, M.D., F.R.S.

(*November* 23, 1916.)

(Chairman—Dr. R. PERCY SMITH.)

On the Relative Perceptions of Movement and a Stationary Object in Certain Visual Disturbances due to Occipital Injuries.

By GEORGE RIDDOCH, M.B., Captain R.A.M.C.(Temp.)

IT is well known that the visual perceptions of form and colour, are to be found dissociated as a result of injury to the occipital lobes. In the records in the literature of several cases of visual defects of cortical origin, it has been noted too, that coarse or even fine movements were detected before fingers presented to the so-called blind field could be recognized or counted. Wilfred Harris [2] has given very full accounts of cases of transient hemianopia, and, in a few, movement was perceived before form or colour. Indeed, he had noticed this dissociation in cases in which the lesions were more gross and the recovery only partial. But, hitherto, so far as I know, movement as a definite visual perception has not been recognized, nor have its fields been charted systematically.

In the examination of war cases of injury to the occipital lobes, I was struck by the frequency with which movement could be detected in the affected field, before a stationary object was seen. Accordingly, I proceeded to chart both, to find out if any conclusions could be drawn from the records, and I hope to show from the cases to be quoted, which are in no way selected, (1) that movement should be recognized as a definite visual perception; (2) that it may be dissociated from vision for stationary objects apparently completely or partially; and (3) that as vision returns, perception of movement recovers before the object can be seen.

The fields for both were recorded with a McHardy perimeter, the results being checked in two of the later cases by the Bjerrum screen. The method employed was as follows: As the slide or the disk on the pointer was approached from the periphery, as soon as the patient said he saw something moving, the chart or the screen was marked. If the square 1 cm. white disk was not distinguished at the same point, the slide or the disk was brought nearer the fixation point till it could be clearly seen, when a record was again made on the screen or chart. The moving slide was thus used as an indicator of the appreciation of "something moving," and of the disk, of the object.

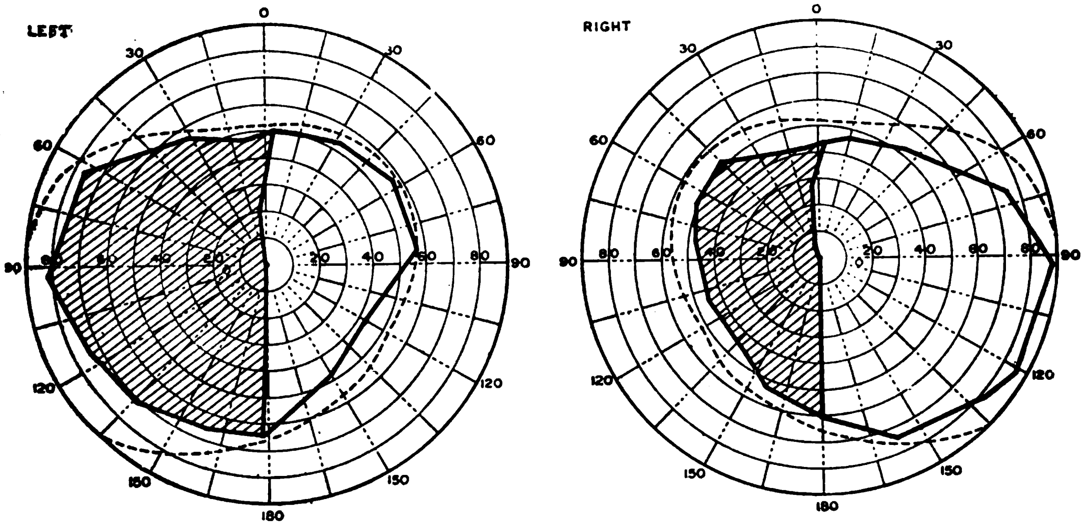
I have purposely limited the disk or finger test to meaning only the appreciation of a stationary object; though frequently, the patient could simultaneously tell the shape of the disk or recognize the finger, when the rough test was used, but this was inconstant. This lack of uniformity of response and apparent untrustworthiness of the patient in appreciating the form of the test object in a part of the field, at one time and not at another, in view of the situation of the injury, was very suggestive. The same irregularity of response to stimuli is known to be typical of cortical disturbances of sensation.

The patients have great difficulty in describing what "the something moving" is like, it is so vague and shadowy; but they are quite sure that neither shape nor colour can be attributed to it, and that it can be seen in a field which is entirely blind to stationary objects.

Notwithstanding the admitted crudeness of the perimetric method, especially for the accurate recording of scotomata, I think the charts will demonstrate fairly well the points I wish to make. Where the Bjerrum screen was used to check the results, they were fully corroborated. In this series of eight cases, seven show the dissociation in the affected field, and one does not. They fall naturally into three groups.

GROUP I.—SHOWING ONLY PERCEPTION OF "MOVEMENT" IN THE AFFECTED FIELD.

Case I.—Lieutenant-Colonel T. was wounded on April 6, 1916, by a bullet in the right occipital region while advancing into action with his men. He did not fall, and, though dazed, he "carried on." He noticed nothing wrong with his vision at the time. About a quarter of an hour afterwards he apparently lost consciousness, for he remembers nothing further till he found himself in the Rawal Pindi General Hospital, Amara, eleven days after he was wounded. He had been trephined and the bullet removed. It was only when he was transferred to Bombay on May 17 that he noticed he could not see objects on his left. He used to miss pieces of meat on the left side of his plate, but in a good light he could tell if an object were moved in his left half field. He was evacuated for England on June 6 with no change in his vision. On roughly testing his visual fields I found that he quickly perceived finger movements in the whole of the left half field, though when the fingers were kept stationary he saw nothing; and, moreover, the field for "movement" compared with my own was normal.



▨ = Hemianopic field for object stimuli.

CHART 1 (Case I).

Chart 1: Central vision $\frac{6}{6}$ right and left. Three months after the date of the injury. There was a complete homonymous hemianopia up to the fixation point for stationary objects, and a full field for movement.

Charts 2 and 3, mapped out, respectively, four, and six and a half months' after the injury, showed no alteration.

The striking features of this case are:—

(1) The complete dissociation of the two types of visual stimuli in the left half field.

(2) The full field for movement. As will be shown in the charts

that follow of cases of hemianopic loss, where appreciation of movement returns, the recovery is never complete, a paracentral or central scotoma remaining as an end-result to represent the amount of irreparable damage done to the visual area. The nearest approach to a scotoma I could get by repeated examination, was a more feeble perception of movement in a small part of the upper quadrant, about 20° from the fixation point; but the patient declared, emphatically, that it was never absolutely lost.

(3) The effects of the dissociation on the patient. This vision for "a something moving" alone, introduces more difficulties into the ordinary life of the patients than when the half field is totally blind. The disparity between the sensations received from the two halves of the retina, is frequently sufficient seriously to affect equilibrium in walking. They tend usually to sway to the partially blind side, though in the cases I have seen, the disability has never been sufficient to make them fall. The disturbance is, of course, most noticeable where the original loss of vision was in the full half field.

Apart from its effect on equilibrium, the inequality of the stimuli received is often a source of considerable annoyance to the patients. Case I, for example, when travelling by train, could see nothing but vague movements as he looked out of the windows on his left, but he could read the names of the stations and appreciate the scenery from the windows on his right. This was so disconcerting to him that now he thoroughly dislikes train journeys. The perception of "motion" kept up a continual desire to turn the head to see what was moving, and the gratification of the desire resulted only in annoyance at being tricked again. The "moving things" had no form, and the nearest approach to colour that he could attribute to them was a shadowy grey.

Case II.—Second Lieutenant W. was wounded in the occipital region by a piece of bomb casing on February 9, 1916. He was knocked down, but did not lose consciousness. He could see from the beginning, though he knew his sight was affected. He had photophobia but no abnormal subjective visual sensations. At the casualty clearing station he was operated upon the same day. He was transferred to No. 2 Red Cross Hospital, Rouen, and Major Austin, on February 23, noted that there was a definite left hemianopia associated with optic neuritis. The following fields were taken a few days after his admission to the Empire Hospital and six weeks after the date of his wound:—

Chart 1: Central vision $\frac{6}{60}$ indistinctly, right, and $\frac{6}{9}$ left. The right and left charts differ considerably, but in both the fields for object and "movement" vision are dissociated. The dissimilarity of the charts for the two

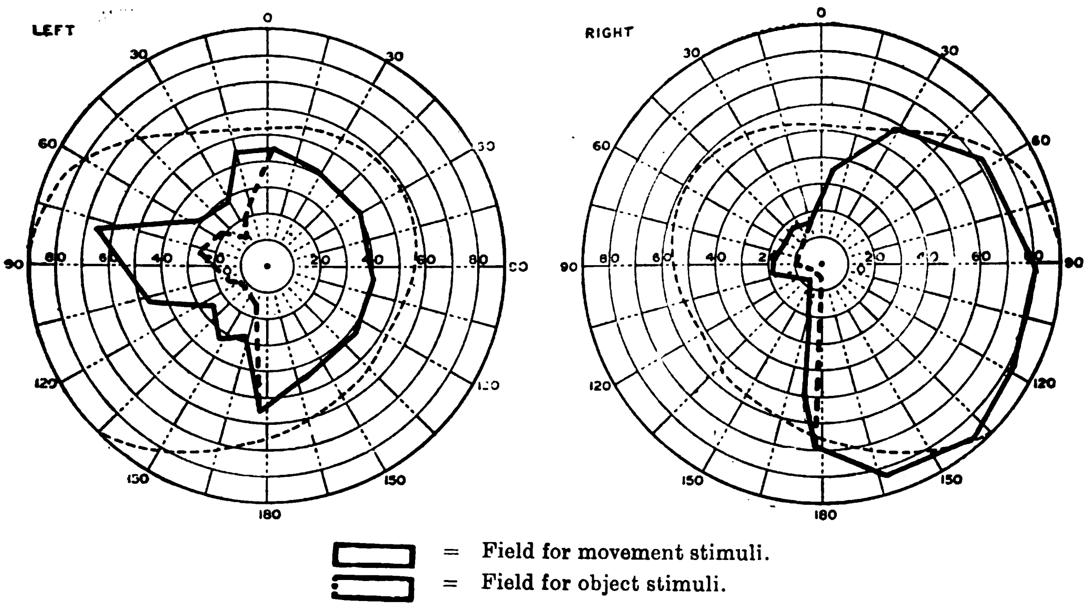


CHART 1 (Case II).

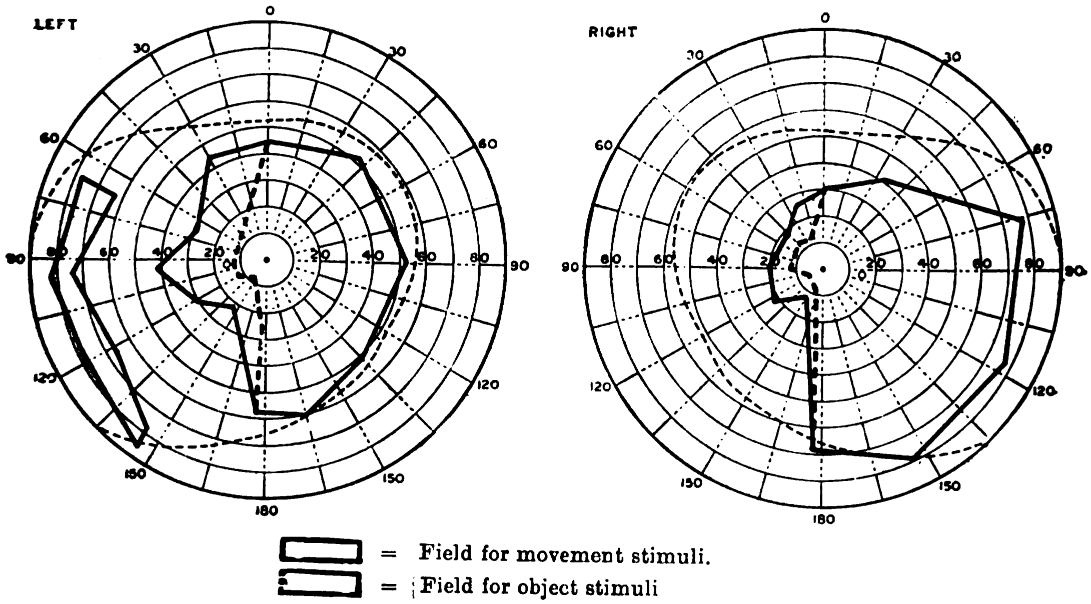


CHART 2 (Case II).

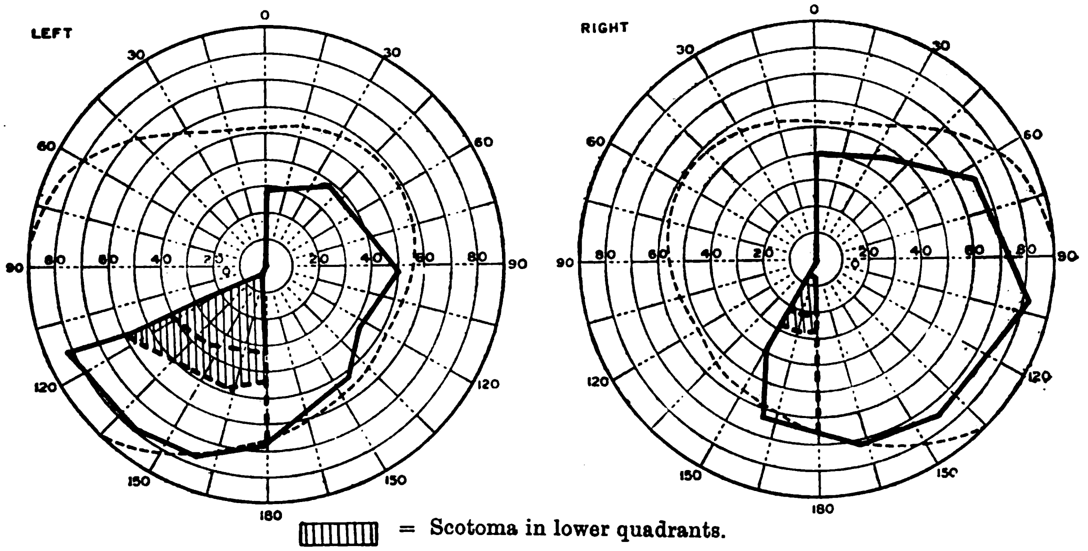
eyes made the observer doubt the accuracy of his observations, but a second record made of the fields was very similar. One notes that the dissociation is greatest in the horizontal plane through the fixation point where most vision is retained. Two months later the patient volunteered that when he was walking in the street he could see "a something moving" when people coming from behind passed him on his left side. There was, however, an area in the middle of his left half field in which it was lost. The "something" had neither form nor colour to him, and he was still as blind as before to stationary objects.

Chart 2: The perimetric charts confirmed his statements, but showed that only the left eye perceived "movement" peripherally. The fields of the right eye had not changed. Moreover, peripheral vision in the left eye was not complete, being absent in the upper and lower parts of the left half field.

The patient was soon afterwards transferred to a convalescent home, so that I have not had the opportunity of observing whether there has been any return of object vision or extension of perception of "something moving."

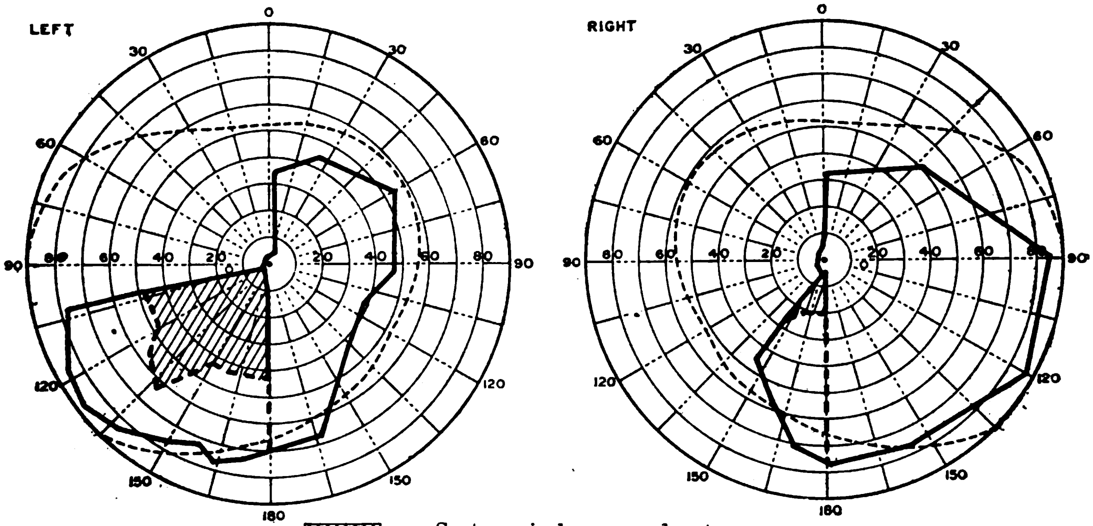
The isolated strip of peripheral vision is interesting. Harris [3] has recorded a case of partial hemianopia in which the object could be seen in a small part of the extra-central field, and he mentioned a similar case of Delépine's [1] of right hemianopia up to the fixation point, with a narrow peripheral zone of vision in the lower right quadrant of the right eye only.

Case III.—Captain de W. was wounded by a shrapnel bullet on December 4, 1915. The entry wound was in the left frontal vertex and the bullet was found, by X-ray examination, to be lying near the right occipital pole inside the skull. The patient never lost consciousness, and he was aware almost from the first that his left half fields were blind. The fields were examined at Alexandria a few days after he was wounded and a complete left homonymous hemianopia up to the fixation was reported. The patient missed meat on the left side of his plate. He noticed first some return of vision in May, 1916. "Movement" only was perceived and only in the periphery of the left lower quadrant. The patient, describing this vision in a small part of the field, said that he saw "something moving" below and to the left, momentarily, only to lose it again as it approached the centre of his field. When walking in the street he could see what he knew must represent a person's feet, though they had no shape, moving on the left, but he saw nothing to represent the body above the ankles. To Dr. Farquhar Buzzard, who examined the patient on May 31, I am indebted for the following note on the visual fields: "Vision in left upper quadrant lost. Some return of vision in the left lower quadrant." On admission to the Empire Hospital in September,



▥ = Scotoma in lower quadrants.

Chart 1 (Case III).



▨ = Scotoma in lower quadrants.

Chart 2 (Case III).

the patient showed symptoms of right motor apraxia. These had been more pronounced during the first six months of his illness, judging by the description he gave of his inability to perform purposive movements with his right hand. The left half field was totally blind for stationary objects, but he had become aware that the narrow area in the periphery of the lower quadrant had enlarged, for the perception of "a something moving," from the margin towards the centre of the field and upwards towards the left upper quadrant.

Chart 1: Central vision $\frac{6}{12}$, right and left, nine months after the date of the injury. The right half field is fairly complete for object and "movement." The left half field is blind to the stationary object, but "movement" is perceived in the lower part of the periphery of the inferior quadrant. This strip in the field is of larger area in the chart for the left eye.

Chart 2: Eleven months after injury. The hemianopic line is seen to miss the fixation point by about 4° or 5°. The "movement" field in the lower quadrant is now broader and longer, but a paracentral scotoma is still left, and a stationary object is not appreciated in any part of the left half field.

The perimetric results of this case have been checked by the Bjerrum screen. He exhibited other interesting visual phenomena, which, like the dissociations, can be compared to some of the sensory defects from cerebral injuries, described by Head and Holmes.

(1) The ability to localize objects seen was disturbed. If a matchbox was held in front of him, though he could bring it at once into central vision, his hand wandered all round in search of it before the box was finally grasped. The difficulty was the same whichever hand was used. The right arm was practically as strong as the left, and only slight loss of sense of position could be found. He always succeeded in the end in finding the thing he wanted, but he had to grope for it. For a long time after he was wounded he was frequently unable to get his eyes fixed on an object, even though he knew quite well its position in space—e.g., his hand.

(2) He was unable to estimate correctly relative distances and lengths. On a piece of paper held flat on the table before him two large dots 4 in. apart, one nearer to him than the other, appeared to be equidistant from him. Their relative positions were, nevertheless, easily recognized when he was allowed to touch the dots with his left forefinger. His answers were more correct if the dots on the paper were side by side, or one above the other. A tall and a short man standing side by side were to him about the same height. He was able, often, to judge with a fair degree of accuracy, the height or breadth of an object, but occasionally, he made gross mistakes—e.g., sitting in a

chair 3 ft. away from me, he thought we were separated by at least 6 ft. Again, a room 4½ yds. broad, was estimated by him to be 10 yds. in breadth. The next minute he gauged correctly the length of a stick and the breadth of a table. His answers were irregular and lacked uniformity.

(3) The stereoscopic element of vision was gone. Everything he saw was flat. People had the appearance of cardboard figures; they had outline, but no depth. If two persons were standing in front of him, he could differentiate them only by their outlines, for they were featureless and had no rotundity. Their noses might have been painted on their flat faces. Friends were recognized only by their voices. A landscape was like a piece of stage scenery. Trees, hills, everything he saw, were at the same level; and yet he could recognize light and shade. A ball was simply a circle, an egg an oval, and a box a rectangle. This phenomenon was evident only if the objects were more than 1 ft. away from him.

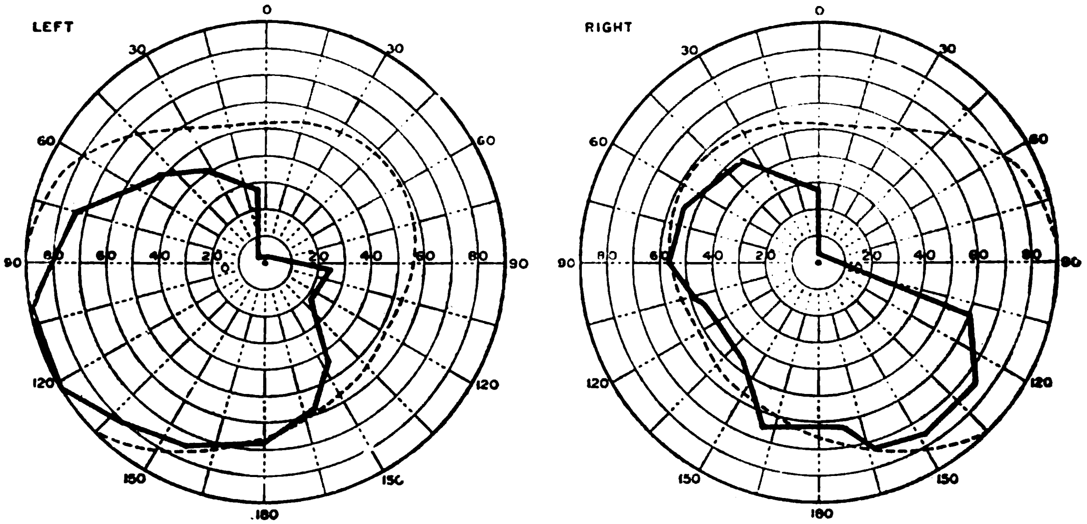
Case IV.—Captain C. received a wound at Gallipoli by a shrapnel bullet on June 6, 1915. He was hit in the left occipital region while advancing; and though dazed, he did not lose consciousness at once. He got up and was able to walk back part of the way to the dressing station before he fell down unconscious. He had noticed nothing wrong with his vision. I examined his fields first on September 28, 1915. Though he was quite aware of his blind upper quadrant, the visual loss hardly inconvenienced him at all. He had no appreciation of movement or other visual stimuli in the blind part of the field.

Chart 1: Central vision $\frac{6}{6}$, right and left. The charts show that the right lower quadrants are also restricted at the periphery. The movement and object fields coincide, and the visual loss reaches the fixation point.

A record of the fields was again made on November 18: There was still no dissociation of the two stimuli. The peripheral restriction of the right lower quadrants was greater. He complained of more difficulty in getting about, and of being more blind to the left.

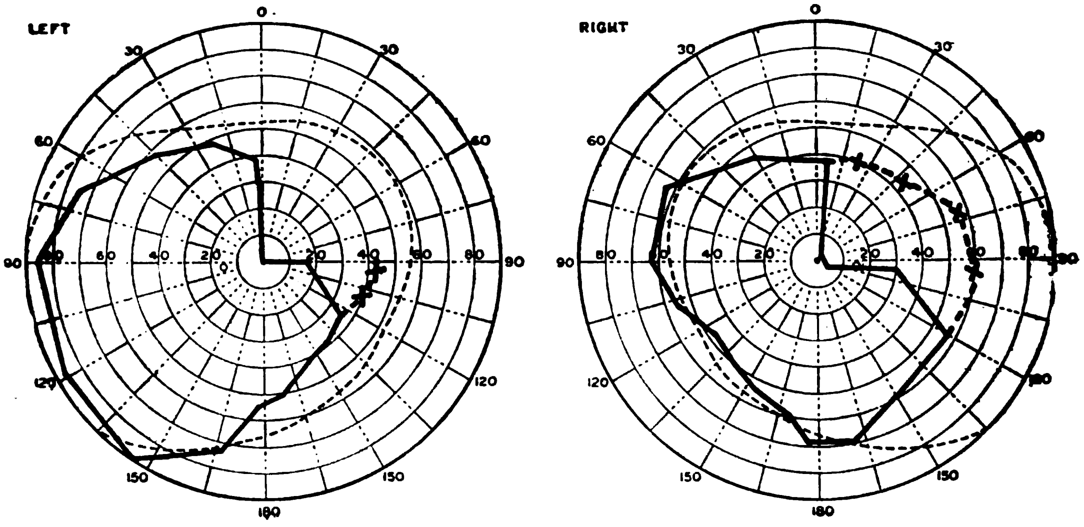
Chart 2: Fields mapped out on December 13, six months after injury. The right lower quadrant field has filled out, and at the points marked ×, he sees "a something moving" just for a second. These points complete the periphery of the field in the right eye chart, but correspond in the chart of the left eye only to the periphery of the defective part of the right lower quadrant. The patient declared that he could not distinguish any object as the slide went past, but that he knew something had moved through his blind field. Vision was obviously recovering in the periphery.

On February 1, 1916, he was admitted to the Empire Hospital for observation. Chart 3 shows his fields for the perception of "movement" and object, taken three days afterwards.



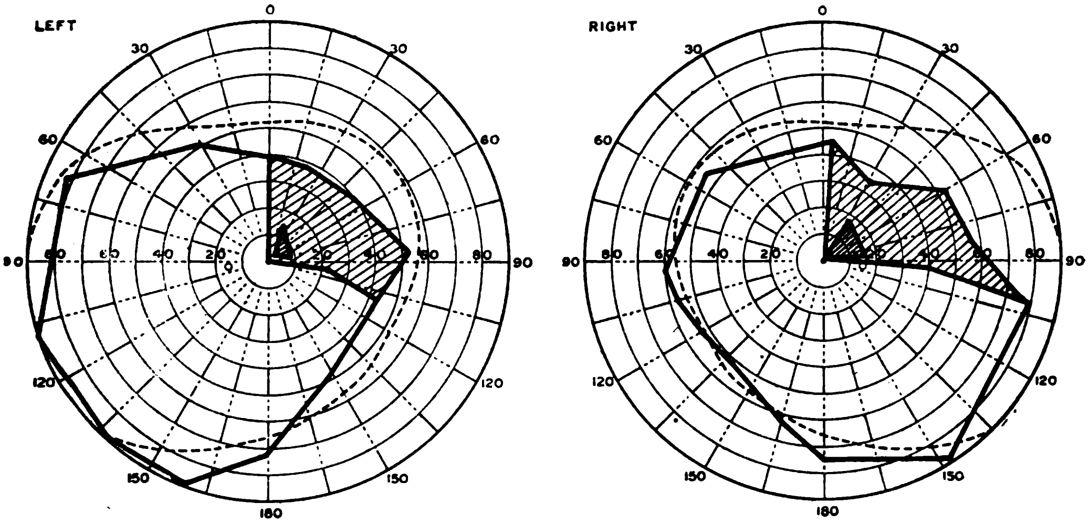
▭ = Fields for movement and object stimuli.

CHART 1 (Case IV).



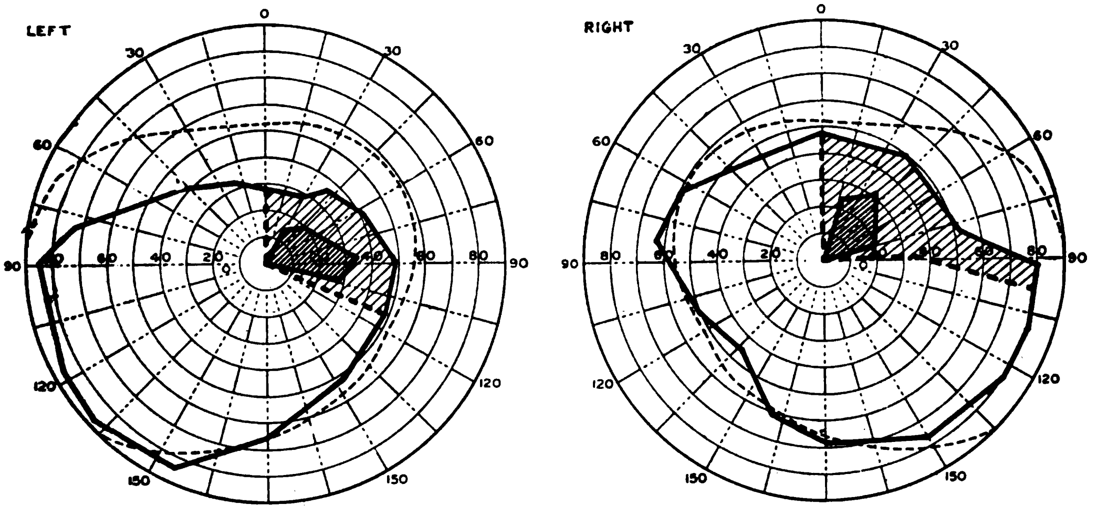
+ + = Points at which the patient was conscious of movements to a second.

CHART 2 (Case IV).



▨ = Quadrantic defect for recognition of an object.
▩ = Central scotoma for appreciation of movement.

CHART 3 (Case IV).



▨ = Quadrantic defect for recognition of an object.
▩ = Central scotoma for appreciation of movement.

CHART 4 (Case IV).

Chart 3: Except for a slight restriction of the peripheral parts of the right upper quadrant, more especially of the right eye, and a triangular central scotoma for movement, in the original blind field, the field is complete for movement, and has not changed for object vision.

The patient was discharged a few days after to the country, and there was no opportunity of making a further record till July 10, when he presented himself complaining that his vision was not quite so good.

Chart 4: The field for movement has altered little, except that the scotoma is a little larger; and a complete absence of object vision, up to the fixation point, is demonstrated.

The fields were again recorded thirteen months after he was wounded. There was still no sign of return of object vision in the upper quadrant, and the scotoma for movement has increased in size.

The prominent features of this case are:—

(1) The return of pèrception of movement alone.

(2) The recovery beginning in the periphery of the original blind field, leaving as an end-result, a central scotoma.

Case V.—Captain H. was wounded on December 16, 1915, by shrapnel in the occiput. Dazed but not unconscious, he realized he was completely blind. They carried him back to the field dressing station, where his wound was attended to. The medical officer at No. 2 Casualty Clearing Station reported that he was admitted there the same night with a serious gunshot wound of the vault, which was bleeding freely. He was unconscious and in a critical condition. The following day the wound was cleaned, and some fragments of bone which were found to be damming a torn longitudinal sinus were removed. On January 10, he was transferred to No. 1 Red Cross Hospital, Le Touquet, for better nursing and comfort. The first note made on vision was dated January 28: "?Very slight vision right eye; blurring of left disk." On admission to the Empire Hospital on February 26, he was very confused and moaned continually. There was a large sloughing septic hernia protruding from the back of his head, and to all appearance involving the whole of the occipital lobes. The parietal bones were loose, and could be moved under the scalp. On the following day he was quite collected, though suffering from pain in the head and neck, and to rough testing he was totally blind. On March 28 the patient said he could see something moving on his right. The stimulus proved to be his wife's shadow on the wall. When tested, he could distinguish between light and darkness, and could detect finger movements in the upper part of the periphery of the right superior quadrant. Stationary objects, form and colour were not perceived. He was totally blind in the rest of the field, and no attempt was made to chart the seeing parts, as it was naturally impossible for him to fix. Later when he began to get out for walks, he noticed that he could detect movements as he passed objects—e.g., lamp-posts, on his right side. He said, "they don't appear to have colour or shape. They look like shadows. Sometimes I can tell if the moving things are white." On November 4 his vision had not altered. He was aware of movement in the same limited part of the field, but he had no idea of shape or colour, and he could not count fingers.

The damage to the occipital lobes was obviously very extensive and deep from the appearance of the hernia; but the case is of interest in so far as it shows that what remained of vision was for movement and light stimuli only.

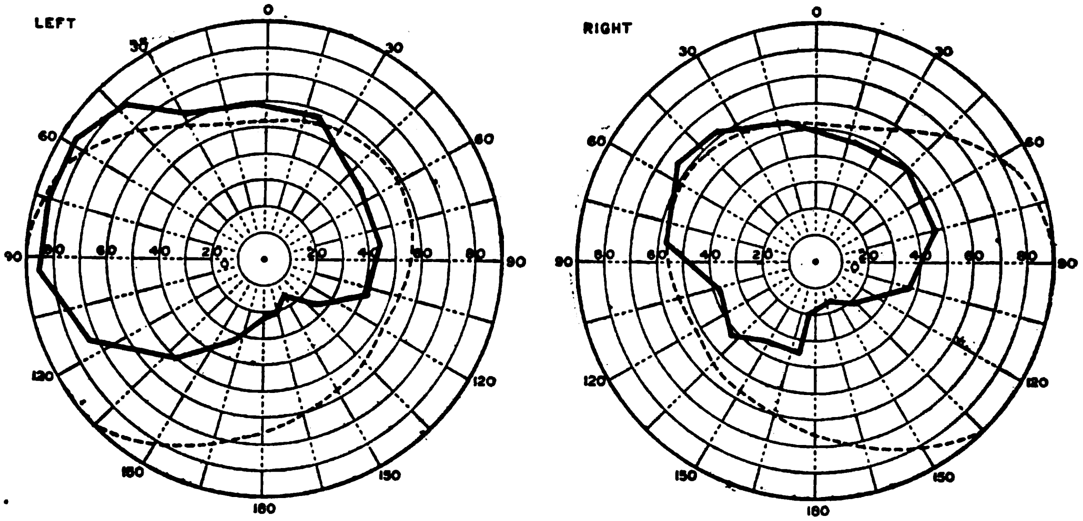
GROUP II.—RECOVERY OF BOTH PERCEPTIONS, THOUGH IN DIFFERENT DEGREE.

Two cases are included in this group, the first showing dissociation and partial recovery of vision for object and movement stimuli in concentric contraction of the fields, and the second in quadrantic defect.

Case VI.—Lieutenant H. was wounded by a bullet in the occipital region on July 13, 1915. He was unconscious for three days, and during that time he had been operated on at Merville. From the scanty information on the transfer sheet I gathered that the entry wound had been enlarged, and that the bullet, which was lying well forward between the occipital lobes, was removed along with a few small pieces of bone, some of which had followed the bullet, and some had remained superficial. The patient, who had sensory and motor loss in both legs below the knees, noticed nothing wrong with his vision for about a month; but during that time he had been kept in bed. His difficulty was in seeing things to the right and on the ground. When he walked he stumbled over objects as high as his knee, unless he kept his eyes fixed on the floor. He had the same difficulty in avoiding things situated on his right side. His fields were first charted for movement on October 5, two months after the injury.

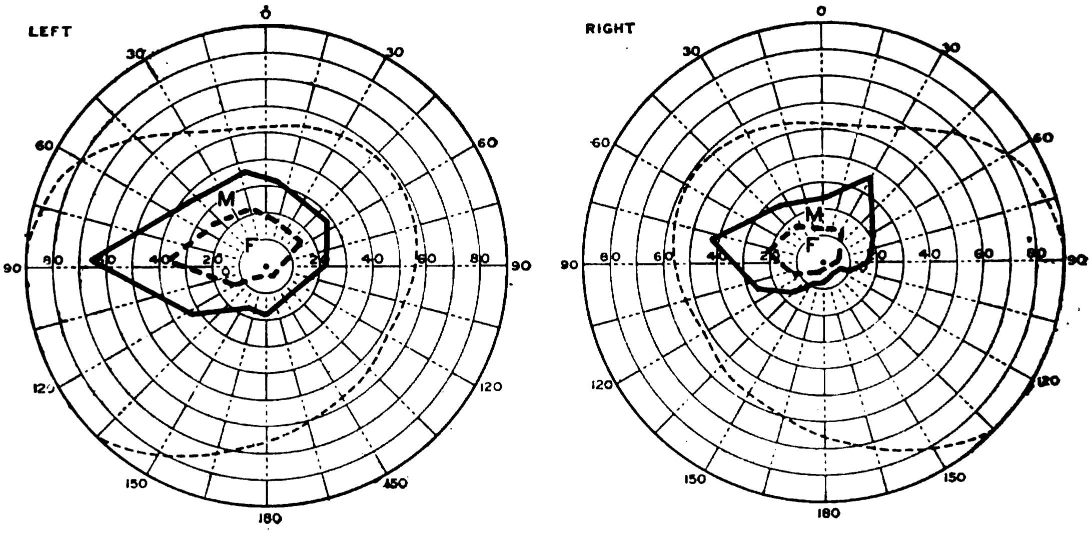
Chart 1: Central vision $\frac{6}{9}$, right and left. The defect was shown to be mostly in the lower quadrants, though the right upper quadrant was also restricted. He was discharged on October 30, and while on leave the sinus reopened. He was again admitted to the Empire Hospital on January 21, 1916, complaining of nausea in the morning and occasional frontal headache and dizziness. No vomiting. He did not think his eyesight had got more restricted, but he noticed the defect more. The fields for movement were charted four days after admission, and the loss was found to be, if anything, a little greater, especially in the lower quadrants.

Chart 2: On February 9 the fields were again mapped out, and they showed a marked general restriction, most pronounced in the lower quadrants and more especially in the right. Vision for stationary objects and for movement



▭ = Fields for appreciation of movement.

CHART 1 (Case VI).



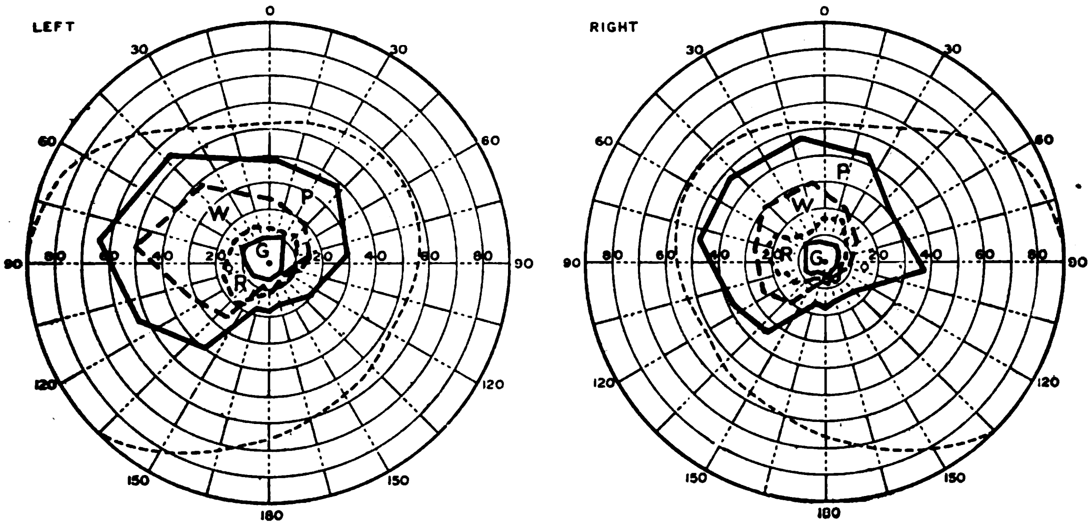
▭ = Fields for appreciation of movement.

⬚ = Fields for recognition of object.

CHART 2 (Case VI).

were completely dissociated, the movement field being the larger. The patient had practically telescopic vision. A radiogram revealed two small pieces of bone, lying between the hemispheres, and on February 3 Mr. Walton operated and removed them. Six days after operation the fields for movement and object, on being taken, were found to have enlarged considerably, and the increase was relatively about the same for both perceptions.

When he was discharged on April 26 the fields were *in statu quo;* but as he had got accustomed to move his eyes about more freely his visual defect disturbed him much less.

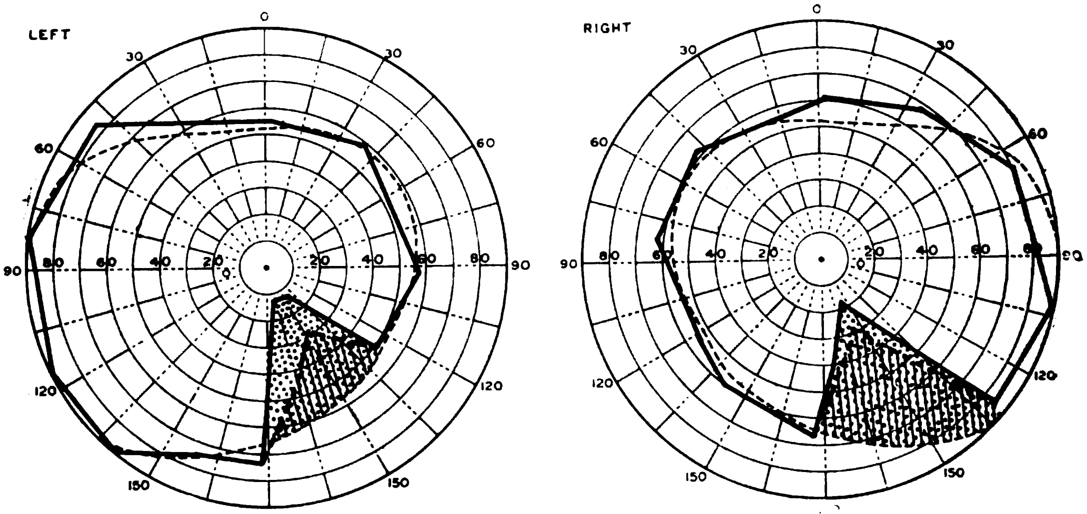


▭ = **Fields for appreciation of movement.**
⬚ = **Fields for recognition of object.**

CHART 3 (Case VI).

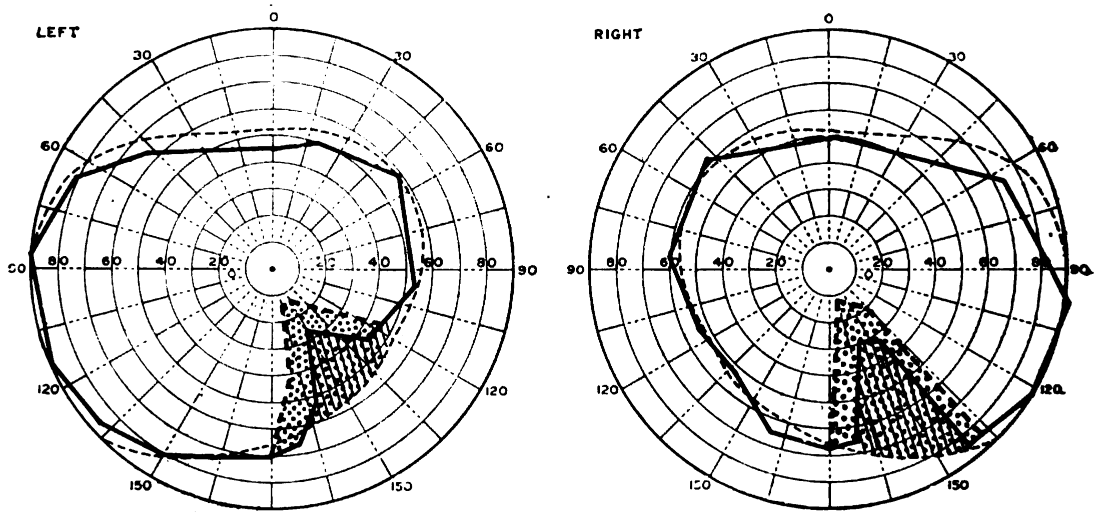
This case shows that dissociation of movement and object perceptions occurs not only in quadrantic and hemianopic defects, but also where the fields are generally restricted.

Case VII.—Captain R. was wounded on July 25, 1916, in the occipital region, by pieces of shrapnel casing. He was walking at the time when the shell pitched behind him. He fell down, but was not unconscious. He could move all his limbs, but he noticed his vision was gone in both lower quadrants. He walked back to Battalion Headquarters, a distance of three miles, but to prevent stumbling over obstacles he had to keep his eyes fixed on the ground. After having had his wound dressed by the medical officer, he walked three miles to the field ambulance, experiencing the same difficulty with his vision.



░ = Object not recognized.
▨ = Movement not recognized.

Chart 1 (Case VII).



░ = Object not recognized.
▨ = Movement not recognized.

Chart 2 (Case VII).

He was "gassed" on the way, though not badly, the effects passing off in about twelve hours. During the eighteen hours he remained at the casualty clearing station no improvement in vision occurred. He was sent by train to No. 2 Red Cross Hospital, Rouen, where he was operated upon by Major Austin on July 28, who reports: "Two foreign bodies against the skull; depressed fracture below, situated a little to the left of the mid-line; trephined; dura cut, but not through, just over longitudinal sinus. No hæmorrhage. Wound excised: now slightly septic." A week after the operation the patient first noticed some return of vision in the left lower quadrant. He is quite certain that recovery began in the peripheral field, and it was first for light and movement only. He could not see stationary objects. The improvement in the left lower quadrant went on till the whole quadrant recovered for all stimuli, light and movement being the pioneers. Movement, he was certain, came back before stationary objects, form, or colour could be perceived. On admission to the Empire Hospital on August 6 his wound was still septic. On roughly testing the visual fields with fingers, I found that part of the right lower quadrant was defective. The loss, which was more for stationary objects than for movement, did not reach the fixation point. Charts were taken on August 26, one month after the date of the injury.

Chart 1: The apex of the wedge in the inferior part of the quadrant reached to between 10° and 20° of the fixation point. Dissociation of the fields for stationary objects and movement was present, the former being the smaller. The left lower quadrant had completely recovered. The fields were again recorded on November 4.

Chart 2: A little improvement had occurred in the fields for both perceptions, more noticeable in the field for movement; and the filling out of the fields was more at the periphery, so that the base of the wedge was narrower. Colour stimuli were not perceived in the blind field. He was more conscious of bright than of dark objects.

GROUP III.—WHERE NO DISSOCIATION OR RECOVERY OF VISION OCCURS.

Certain cases of hemianopia, however, show no dissociaton of object and movement vision, and remain stationary, at all events, for many months. But I have found them to be relatively few in number, and only one occurs in this series of nine cases. One might suggest tentatively, that coincidence of the fields and absence of any sign of recovery, are due to the injury being more extensively subcortical. I cannot bring forward pathological material to prove this assertion, but Swanzy, writing on relative hemianopia, said that he believed it was the result of a lesion of less intensity than that which caused absolute hemianopia. The following case belongs to this group:—

Case VIII.—Lieutenant M. was wounded at Loos about September 30, 1915, by a rifle bullet in the left occipital region. On admission to Rawal Pindi Hospital the next day he was in a semi-conscious condition, quite unable to give the name of his unit or his people's address. Later he demonstrated to the doctor his right hemianopia during a fairly lucid period. On November 2 he was admitted to the Empire Hospital. The fields were first recorded on November 13, a right homonymous hemianopia up to the fixation point being found. There was coincidence of the fields for the perceptions of object and movement.

Chart 1: Central vision $\frac{6}{6}$, right and left. Charts were taken at intervals till June, 1916, and no change in the fields could be detected.

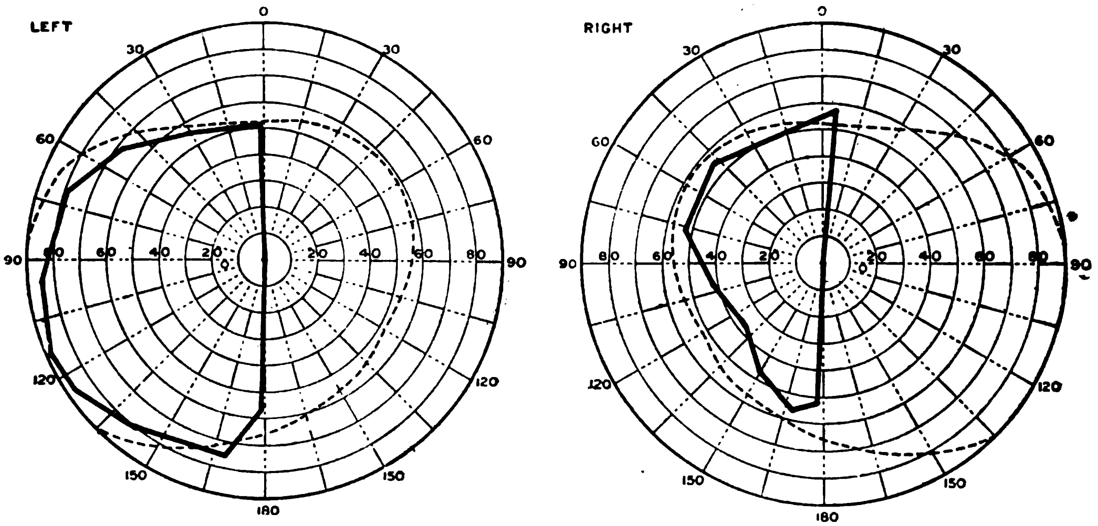


CHART 1 (Case VIII).

This series of cases more fully described will be incorporated in a paper in *Brain* on "Certain Visual Dissociations due to Occipital Injuries."

CONCLUSIONS.

I have attempted to demonstrate from cases of visual defects of occipital origin, (1) that the consciousness of "a something moving" should be recognized as one of the visual perceptions; (2) that it may be dissociated from the perception of a stationary object; (3) that where recovery of vision occurs, the perception of "movement" precedes that of the object; and (4) that recovery of "movement" vision begins at the periphery.

In investigating visual disturbance due to occipital injury, I have been deeply impressed by the points of similarity which these disturbances present with other sensory defects associated with damage to the cerebrum. Vision is a form of general perception, and I feel that much valuable information might be collected, and that a wider conception of what vision is might be obtained, if it were considered not as a special sense, but as a part of general sensation.

The visual apparatus belongs to the afferent sensory system, and conveys sensory impressions. Vision, indeed, is highly specialized for the performance of particular functions. Physiologically, however, sensory activities appear to be governed by certain laws, and one might suppose that an interference with the visual paths would give rise to results comparable to what obtains when other sensory mechanisms are disorganized. It should be possible to compare defects of vision and of sensation from lesions at corresponding physiological levels. I will be content, however, with merely mentioning a few of the visual defects which I think resemble disturbances of sensation.

(1) Dissociations of primary visual perceptions of light, movement, stationary objects, form and colour.

(2) Inability to localize an object seen, and to estimate its length.

(3) Inability to appreciate "difference"—relative lengths and distances.

(4) Inability to distinguish between a flat disk and a sphere.

(5) Irregularity of response to stimuli. This apparent untrustworthiness of the patient has been described by Head and Holmes [4] as being a typical feature of cortical disturbances of sensation.

My grateful thanks are due to Dr. Farquhar Buzzard, Dr. Collier, Dr. Leonard Guthrie, Dr. Head, and Dr. Kinnier Wilson, for permission to publish my notes on their cases and for kind advice.

REFERENCES.

[1] **Delépine.** *Trans. Path. Soc. Lond.*, 1890, xii, p. 2.
[2] **Harris, Wilfred.** *Brain*, 1897, xx, p. 307.
[3] *Idem. Ibid.*
[4] **Head** and **Holmes.** *Brain*, 1911-12, xxxiv, p. 189.

DISCUSSION.

Dr. LEONARD GUTHRIE: I wish to congratulate Captain Riddoch on the excellence of his paper. As he himself mentioned, the fact that recovery of perception of movement may precede that of stationary objects, has already been recorded. But he is the first to draw attention to the significance and importance of the observation. He suggests that this dissociation between perception of movement and of stationary objects may be analogous to the dissociation which is known to occur in other forms of sensory disturbance, and that a similar dissociation may be found in the case of special senses other than the visual. I would now suggest that dissociation is always between the more crude and primitive functions and those which are more elaborate and later acquired. It is well known that in cases of gross cerebral lesions recovery occurs sooner and more completely in the case of simple functions than in those more specialized. My contention is that perception of movement is the most rudimentary form of vision, and is necessary for the preservation of lower forms of life. Many examples drawn from the animal kingdom show that the perception of movement serves to attract the prey to the captor and is excited by the captor in order to catch its victims. The cerastes viper for instance lies half buried in the sand and keeps its horns in motion in order to entice small animals within its reach. The Indian hunter is said to draw deer within gunshot range by waving a rag on the end of his ramrod. Some years ago there was an outcry in the public Press against the cruelty of feeding the snakes at the "Zoo" on live animals. The answer was that many kinds of reptiles will not touch their food unless it is alive and moves. As a boy I used to keep lizards as pets, and I found that they would walk over or by dead flies and other insects, without taking the slightest notice of them, but if I introduced living insects, the lizards would see them at once and dart from one end of the cage to the other in order to seize them. I could, however, train them to eat dead insects when I impaled the insect on a pin at the end of a stick and waved it about at a distance from the lizard. Many inhabitants of the marine world are provided with tentacles and antennæ, by movement of which they induce other creatures to come within reach in the hope of obtaining a meal for themselves. On the other hand, the python will lie coiled on a tree by the waterside, motionless and invisible to the deer which comes to drink. We have all seen a cat squatting immobile for hours before a mouse hole. If the cat moved the mouse would see it and would never be foolish enough to emerge from its hole and get caught. Certain birds, notably the quail, and insects are said to feign death when in danger. But the quail or insect is like Wordsworth's "simple child." "What should it know of death?" It is, however, quite probable that instinct leads it to become a "stationary object" and thus escape detection. I have made no special investigations in the case of human beings, but every one knows that young infants will turn their heads and eyes towards a moving body brought from the periphery within their range of vision, whereas they may take no notice of stationary objects held before their eyes. Amongst the many interesting observations in Captain Riddoch's paper are two to which I would refer. One is that in some cases of occipital lesions, perception of movement occurs first at the periphery of the fields. This is exactly as might be expected. It is obvious that perception of movement will be the more useful in proportion to the width of its range towards the periphery. Also, the recovery of perception of movement from the periphery inwards, seems in favour of the view that the peripheral vision is a crude and primitive form, and therefore returns more readily than more specialized visual functions. The other interesting point is that one patient recovered vision for objects, but complained that they all looked flat. He could not see any difference between a sphere and a flat disk. In other words he has lost the appreciation of gradations of light and shade which enables us to make such distinctions. He sees objects flat, as they appear in a brilliant searchlight or in "stageland," where shadows are eliminated by the intensity of the illumination. This again implies a return of vision which is nevertheless rudimentary and decadent. He sees objects flat just as they appear to the aborigine, the young child or the "post-impressionist" who attempts to depict them.

Mr. J. HERBERT PARSONS: This paper opens up a field of far reaching importance, not only from the biological standpoint, to which Dr. Guthrie has so ably drawn attention, but also from many other points of view. It is customary in physiological and ophthalmic text-books to divide visual sensations into the light sense, the colour sense, and the form sense. This has always seemed to me a convenient but not very scientific division, but if it is accepted the sense of movement has just as much (or as little) right to be included as a fourth division. The crudity of the classification is best seen on considering threshold values. Thus, Charpentier's beautiful experiments have proved conclusively that at the threshold the minimum light appreciable is a function not only of the intensity of the light but also of the area of retina stimulated. So far as the macula is concerned, where adaptation is negligible, the relation of intensity to area follows a quite definite mathematical law. As regards colour, it is legitimate, with Hering, to include under this designation both toned and untoned colours, and in any case it is obvious that colour without light is unthinkable. The foundation of the form sense is the appreciation of two points of light as discrete points, and here again the threshold values are dependent entirely upon the light sense, modified or unmodified by a toned colour constituent. The visual appreciation of movement is a function of light, colour and form, and from the physiological point of view it is impossible to dissever these constituents. Hence I think that Captain Riddoch emphasizes too strongly his distinction between appreciation of movement and that of form. So far as the highest cortical representation is concerned I agree that there is representation of movement as such, almost entirely divorced from appreciation of form, colour, and even light: but this is because I regard the highest cortical centres as the physical basis of psychological phenomena, and therefore of that analysis of precepts and selective re-synthesis which creates the concept, in this case—movement. From the biological point of view the appreciation of movement is primitive. Here the inchoate mass of dimly perceived sensations doubtless arouses the mere impression of "something moving." With the differentiation of the sense organs, and notably of the projicient sense organs, as has been so admirably demonstrated by Sherrington, there proceeds *pari passu* a differentation of the inchoate mass of sensations, an analysis or selective segregation, which permits of the separate appreciation of light, colour, and so on. Yet the analysis appears never to be complete, and it is, moreover, accompanied by re-syntheses which are the basis of a scientific, as opposed to a metaphysical, creative evolution.

Section of Neurology.[1]

President—Dr. W. D. HALLIBURTON, F.R.S.

(*January* 25, 1917.)

Demonstration of Cases.

By G. NEWTON PITT, Major R.A.M.C., M.D.

Case I.: Fracture of Spine; Paraplegia, with Sweating below the Level of the Lesion.—P. Fracture of spine: fracture dislocation of lower dorsal region, December 25, 1915. When admitted on February 24, 1916, there was partial loss of sensation to umbilicus, with some muscular power in leg. A suprapubic operation had been done in Boulogne. Knee-jerks both present. Plantar reflexes flexor and, later, extensor. Operation, March 29, 1916 (Colonel Armour): Removal of fractured lamina of dorsal vertebra and separation of adhesions. Patient has gradually recovered power; on September 14 his suprapubic opening closed, and now he has good control of urine, although the wound has broken down three times. There is marked sweating below the level of the lesion, and the levels of hypo-æsthesia and sweating are identical; the sweating is sufficient to keep his bed constantly wet. Sheets have to be changed four times daily, and blankets twice daily.

Case II.: Cerebral Hernia, following Bullet Wound.—C. Wounded by rifle bullet on October 1, 1916, in right parietal region, 3 in. above by 4 in. behind external auditory meatus. There was a depressed fracture and pieces of metal were removed with small trephine opening, October 3, 1916. Condition on admission: Hemiopsia (left), no motor nor sensory signs. There was a cerebral hernia with septic granulations. November 9: Pain, vomiting, and increase in size of hernia. Colonel Armour enlarged trephine wound and drained a small abscess, with relief resulting. December 3: Rise of temperature, headache, and stupor; hernia very much larger and an escape of a quantity of cerebrospinal fluid, which continued till December 26. Wound now nearly healed, and hernia has disappeared.

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[1] Clinical Meeting held at King George Hospital.

Discussion is invited as to what extent the size of large herniæ is due to distension of the lateral ventricle.

Case III.: Aphasia, following Cerebral Injury by Shrapnel Bullet.—J. Wounded by shrapnel on October 10, 1916, in right external frontal process; a fragment of metal is lodged 2 in. above the inion. The patient was aphasic on admission; his reading was gibberish. He had auditory aphasia and did not understand all that was said to him. No motor nor sensory symptoms; he was dull, heavy, and incontinent, both of urine and fæces. His fields of vision are normal, and there is no optic neuritis.

The point of interest lies in the occurrence of aphasia, considering the course the bullet took.

(*January* 25, 1917.)

Demonstration of Cases.

By J. S. Collier, Captain R.A.M.C., M.D.

Case I.: Abortive Poliomyelitis.—V. This man was admitted to King George Hospital on November 17, 1916. He was on leave from Lark Hill. Temperature, 103°F., pulse 96, respiration 24. He complained of severe headache and stiffness of neck, but there was no vomiting nor other signs; all reflexes were normal. As several cases of cerebrospinal meningitis had occurred at this camp, lumbar puncture was performed. There was no increase of pressure, and the fluid appeared clear. Cell count gave 1,250 mononuclear cells per cubic millimetre, but was sterile on culture. Temperature lasted for a few days, and except for slight left facial herpes nothing else occurred. Wassermann reaction was negative. No physical signs in chest, but X-ray suggests old tubercle of lung. Lumbar puncture, January 17, 1917: Cerebrospinal fluid not under pressure; fluid clear and cell count normal.

Case II.: Myasthenia Gravis.—B. This man was shot through the upper jaw in November, 1914; at the same time he received an injury to the left eye. In September, 1915, he noticed that he stumbled while carrying his pack and fell on his knees after walking a short distance; after rest he could go on again. This disability upon exertion gradually increased, and he had difficulty in raising himself from the lying to the sitting position. More recently the same paralysis on fatigue has appeared in proximal muscles of upper limbs. There has never been any sign of ocular, facial, buccal, or pharyngeal weakness. There is great weakness of all the muscles of the trunk, with attitude and gait resembling that of myopathy, the shoulders being thrown back with relative lordosis, and moving from side to side with each step. He is unable to regain his feet from the supine position without help, and in making the attempt goes through the well known movements characteristic of weakness of the trunk. On electrical examination the myasthenic reaction is well marked. Pupils react to light and convergence. There is no wasting of muscles. Deep reflexes are present.

Case III: Spinal Injury; Paraplegia in Flexion, with Pressure Palsy of External Popliteal Nerve (Right).—F. Gunshot wound of the spine, eighth dorsal vertebra, on July 31, 1916. Admitted to King George Hospital on August 10, 1916. The condition is one of complete motor and sensory paralysis in flexion. The point of interest is that there is atrophic palsy, with loss of sensibility in right anterior tibial and peroneal muscles, with a drop foot and dropped toes and a flexor response on left side, with a retracted foot and extensor response on opposite side.

The point on which discussion is invited is the cause of this peripheral nerve or root lesion. The fifth lumbar area on the left side is not reflexogenous, nor is it clearly so on the right.

Case IV: Spinal Cord Injury, complicated by Root Lesions.—D. Injury from being buried in dug-out on October 1, 1916. Patient was unconscious for twelve hours. Complete paralysis in both legs for five days. Retention of urine with overflow for two days. There is an angular curvature at the junction of the dorsal and lumbar region, the most prominent part of angle being the twelfth dorsal spine. There is a separation of 1¼ in. between the eleventh and twelfth dorsal spines, and there does not appear to be any lateral displacement. There is some weakness of the lower lateral abdominal muscles, as shown by bulging of the lower abdominal walls on sitting up, or by cough, which is improving. Right leg normal; left leg shows fair power in all movements, but rather less than the right, except in the peroneals and extensors of toes, which are almost completely paralysed. The tibialis anticus is weak, but contracts more powerfully. The faradic excitability of these muscles is much diminished. Knee-jerk and ankle-jerk on the left side are clearly increased. Rectus and ankle clonus are present; flexor plantar response. Vibration felt well and equally both sides; no loss of sense of position in either leg. There is well marked diminution of pain sensibility over left half of trunk and left lower limb below level of nipple. No loss to touch; heat and cold are not altered. There is much deeper relative sensory loss to all forms over areas of twelfth dorsal, first and second lumbar roots, and over fifth lumbar and first sacral roots; full control of sphincters. The trunk reflexes are much diminished below the level of the nipple on the left side and below level of umbilicus on right side. Cremaster absent on both sides. Deep reflexes in right leg are normal. There is apparently a lesion of the left pyramidal tract, giving rise to spastic signs in left leg, and lesions of the roots, twelfth dorsal, first, second and fifth lumbar and first sacral, the latter lesions preventing the exhibition of extensor response.

The sensory loss is a subject for discussion.

Case V.: Paraplegia with Sweating below the Level of the Lesion.—S. Gunshot wound of the spine. Wounded August 29, 1916. Complete paralysis and loss of sensation below eighth dorsal vertebra, with knee-jerks and plantar reflexes retained. Shown because of the marked sweating below the lesion, with sweat rash.

(*January* 25, 1917.)

Gunshot Wound Producing Damage of Twelfth and Spinal Accessory Nerves, with Cross Union of their Fibres.

By Sir WILLIAM COLLINS, M.D., M.P.

LANCE-SERGEANT M., aged 35. Patient was wounded on March 8 by bullet which entered on right side of neck, escaping through left orbit, the left eye being shot away. He was a prisoner of war at Bagdad till August, 1916. Operated for resection of left eyelid on December 20, 1916. Examined by Dr. Buzzard on December 29, 1916, who reported as follows: After being wounded on March 8, 1916, patient was unconscious for a short period, and found he could not raise his right arm beyond a certain distance; unable to phonate or articulate properly. Has gradually recovered power of articulation and phonation, but articulation interfered with whenever he throws his right trapezius or sternomastoid into action. Tongue atrophied on right side and protruded to right. When spinal accessory muscles are thrown into action he is conscious of a spasm in the tongue drawing it more to the right. With violent exertion of these muscles defect in articulation becomes extreme. No obvious wasting nor loss of power in trapezius or sternomastoid, though when at rest they stand out with a little increase of tone compared to those on left side. What is the condition of the larynx? Probably some right-sided palsy at one time. The palate moves well. No paralysis of other parts, no other exertion except that involving trapezius and sternomastoid which interferes with articulation. Dr. Dundas Grant's report (January 17, 1917): Immobility of right vocal cord slightly external to mid line (cadaveric position), complete recurrent laryngeal palsy. Palate moves well. Nasopharynx normal.

(*January* 25, 1917.)

A Case of Pituitary Tumour.

By H. S. CLOGG, M.S.

W., AGED 42. Pituitary tumour. Admitted to King George Hospital on November 26, 1916. Past history: Five months history of (1) severe frontal headache; (2) failing sight; "things looked black"; (3) feeling drowsy; (4) putting on weight, loss of sexual desire. He was doing sanitary work at Boulogne at the time. Condition on admission: Rather drowsy; facies "Napoleonic," double chin, large supra-clavicular pads of fat; thyroid gland not felt; complains of failing sight; says this is getting worse; also of frontal headaches, which awaken him at night; he cannot get about or read much on account of his sight failing. Eyes: Both optic disks pale. General atrophy throughout. Left eye white and more atrophic than the right. Temporal hemianopia more marked in left eye. Loss of central vision in right eye. Wassermann reaction positive on December 6, 1916. He is having iodide and mercury. Galyl, 30 cgm., given on December 8, 1916, and January 1, 1917. Wassermann reaction positive on January 17, 1917.

(*January* 25, 1917.)

Complete Division of Spinal Cord with Return of Reflex Activity below the Lesion.

By E. FARQUHAR BUZZARD, M.D.

PATIENT wounded by shrapnel while lying down on July 21, 1916. Bullet entered the back of chest at inner border of left scapula at level of fifth dorsal spine and lodged itself in the vertebral canal between the fourth and fifth dorsal vertebræ, causing immediate and complete paraplegia. Admitted into King George Hospital on August 6, 1916, with complete loss of sensation and movement and reflexes below the level of the nipples. Severe cystitis. August 25: Plantar stimulation elicited extensor responses in both feet. September 11: Laminectomy performed by Colonel Armour. A large round lead bullet was found lying in the thecal cavity, having completely divided the spinal cord. After removal there was a clear gap of three-quarters of an inch between the proximal and distal portions of the cord, containing no vestige of granulation or other tissue. September 12: Knee- and ankle-jerks present on both legs. Involuntary flexor spasms. November 10: Plantar stimulation causes homolateral flexor spasm with an extension spasm of the contralateral limb. Stimulation of the abdominal surface causes (1) an early local contraction, and (2) a delayed general contraction of the abdominal muscles with flexor spasms of the legs. Cremasteric and bulbo-cavernous reflexes are present. The sphincters are not relaxed and the bladder and bowel are evacuated at periodic intervals. A very strong faradic current is required to obtain the slightest contraction of any muscle below the knees, and this is also the case when the electrode is placed over the peroneal nerve on the outer side of the fibula. The patient is not conscious of any visceral sensations in the abdomen.

(*January* 25, 1917.)

Bullet Wound Producing a Segmental and Sensory Lesion of the Brain Stem.

By E. FARQUHAR BUZZARD, M.D.

PRIVATE R. C. Wounded by rifle bullet on July 27, 1916. The bullet entered the left temple, traversed the head, and came out through the right external auditory meatus, causing complete loss of sight in the left eye and destruction of the right ear. He was unconscious for some days and a prisoner with the Turks in Bagdad, being afterwards exchanged. He complains now of some pain in the lower part of the right face, and deafness and some giddiness. He presents complete blindness of the left eye and complete deafness of the right ear. The left eye moves well only in an inward and downward direction. The left side of the face does not move very well in emotional movements, but equally with the right in voluntary movement. There is much loss of sensibility to pain over the greater part of the right side of the head and more complete anæsthesia over the area supplied by the lower two divisions of the fifth nerve, but the corneal reflex is present on that side. There is also weakness of the right masseter muscle and deviation of the jaw to the right when the mouth is opened. Vision in the right eye is $\frac{6}{9}$, and ocular movements on that side are good.

Section of Neurology.

President—Professor W. D. HALLIBURTON, M.D., F.R.S.

(*March* 22, 1917.)

Chairman—Dr. PERCY SMITH.

Case for Diagnosis.

By JAMES TAYLOR, M.D.

W. P., PLATELAYER, was admitted on March 6, 1917, with a flaccid paraplegia. In July, 1916, patient became suddenly ill with headache, fever and vomiting. The fourth day after the onset he attempted to get out of bed, but fell. The legs were œdematous from the knees to ankles, and there was a feeling of pins and needles in the knees and ankles. A local doctor was called and his case diagnosed as typhoid fever. He was taken to Bethnal Green Infirmary on the tenth day following the onset. There was no epidemic of enteric at the time. Past health and family history were good.

On admission there was a large sacral sore about the size of half a crown; the legs swollen and œdematous. The lymphatic glands of the groin were enlarged on both sides. There was no pain nor tenderness in the spine. Vision: Right $\frac{6}{9}$, left $\frac{6}{9}$; disks healthy, and no limitation of visual fields. The pupils reacted to light and accommodation. Motor system: flaccid paraplegia of lower extremities, with involvement of the trunk muscles as far up as the level of the umbilicus. There was double foot-drop, with inversion. There was very slight movement of the flexors and adductors, but no movement in other muscles of the legs. The lower limbs were not flail-like, but there was limitation of movement at knees and ankles on passive movement. On attempt to sit up there was marked upward deviation of the umbilicus. There were no involuntary movements and the upper extremities escaped. Electrical reaction: Weak response to faradic stimulation in adductors and flexors of thigh; reaction of degeneration in remaining muscles. Sensation: Feelings of pins and needles in the legs, and tenderness in the right inguinal region and in the calves of legs. There was no objective sensory loss. Reflexes: Knee-jerks, ankle-jerks and plantar reflexes absent. Lower abdominals absent, upper present. Arm-jerks all present. There was no loss of sphincter control. Wassermann reaction negative.

(*March* 22, 1917.)

Case of Labyrinthine Deafness and Vertigo.

By J. S. Risien Russell, M.D.

W. W., aged 45, chauffeur. Two months before admission sudden attack of unsteadiness and giddiness, unaccompanied by sense of rotation. Six attacks occurred on first day, and have persisted ever since. He is fairly comfortable when at rest. Sensations of nausea were present at onset, but he never vomited. Three weeks later he began to go deaf, and now has humming noises in both ears. Some headache occasionally.

On examination: Bilateral nerve deafness, with loss of both high and low tones. Rotation in various planes does not evoke the normal response. On passage of galvanic current patient inclines away from cathode. On stoppage of the current he sways to the anode. Nystagmus was increased during passage of current (15 to 18 ma.). Wassermann reaction negative. No other physical signs save slight nystagmus to sides.

(*March* 22, 1917.)

Case of Tumour of First Dorsal Region of Spinal Cord.

By W. Aldren Turner, C.B., M.D., Lieut.-Col. R.A.M.C.

J. S., schoolmaster, and since September, 1914, Quartermaster-Sergeant in West Kent Regiment. He was admitted on March 12, 1917, complaining of pain in shoulders and arms. In May, 1914, he underwent an operation for carcinoma (?) of the left breast at the Miller Hospital, and the following September had swollen glands removed from the left axilla. In December, 1915, he had sciatica of the right side, but this did not necessitate his going off duty. In February, 1916, neuralgic pains developed in the right shoulder, which caused him sleepless nights; pain was absent during the day time. In May, 1916, the left shoulder began to pain him, and the following month there was excruciating pain in both shoulders, radiating down the arms, with a feeling of pins and needles in the hands. In July, 1916, he rejoined his regiment at Chatham, and the condition became worse; the right hand was weak, and he noticed wasting in the small muscles of the hand. He was discharged from the Army on August 23, 1916. In January, 1917, the pain became more intense, and was present day and night.

There is at present tenderness over the cervico-dorsal region. Vision: Right, $\frac{6}{9}$; left, $\frac{6}{9}$; fields and disks normal. There is narrowing of the right palpebral aperture, and the right pupil does not dilate to shade or to mechanical stimulation. Sweating occurs over the left half of the body. Definite weakness and wasting of the right hand is present; patient cannot make a fist on that side. Wasting of the intrinsic muscles of the right and left hand, but more definitely so on the right. Electrical reaction shows reaction of degeneration. No objective sensory loss can be detected. The knee-jerks are present, and plantar response is of flexor type. The arm-jerks are inactive and the abdominals sluggish. There is urgency of micturition. Patient walks without defect.

(*March* 22, 1917.)

Case of Myotonia Atrophica.

By W. ALDREN TURNER, C.B., M.D., Lieut.-Col. R.A.M.C.

K. N., FEMALE, aged 29, was admitted on February 19, 1917, complaining of attacks of severe epigastric pains, which have existed since last August. Pain which radiates to the left scapula and left clavicle, occurs every seven to ten days and lasts for fifteen minutes, subsiding without treatment.

Patient was born in Ireland, went to Paris at the age of 3, remaining there until the age of 20. She was always delicate, and during menstrual periods had to rest in bed for three to five days. At the age of 21 she returned to England and attended school at Tunbridge Wells. At that time she first observed difficulty in relaxing hand grasp when playing tennis, and she would easily become exhausted when walking short distances. Weakness has been progressively getting worse. A family history shows no disease of a similar nature.

Patient is tall and thin, has a sallow complexion, and is poorly nourished. The lungs and abdomen are normal. Disks are normal. Both lenses show peripheral ring of faint granular opacities. The special senses are normal. There is definite bilateral localized weakness and wasting with slow relaxation of the hand grasp (myotonia). The following muscles are wasted: Occipito-frontalis, corrugator supercilii, levator palpebræ superioris, temporals, masseters, facial, laryngeal, sternomastoid, flexors and extensors of the forearm, and the intrinsic muscles of the hand. The lower extremities though thin are not wasted. All muscles show good reaction to the interrupted current. Mechanical stimulation to extensors and flexors of forearms and legs show slow relaxation. There is no sensory loss, reflexes are normal, and there is no sphincter disturbance. She walks fairly well.

(*March* 22, 1917.)

Neuritic Type of Progressive Muscular Atrophy (Charcot-Marie-Tooth).

By W. ALDREN TURNER, C.B., M.D., Lieut.-Col. R.A.M.C.

E. C., MALE, aged 39, a steel turner, was admitted on January 24, 1917, with weakness and wasting of the legs. Weakness and wasting first appeared below the knees seven years ago; during seven months condition developed very quickly, and seven months from onset he was admitted to King's College Hospital, where he remained one month. His state has remained more or less stationary since, but wasting and weakness have developed in the muscles of the thigh. He walked into the hospital with a stick and supported by his wife's arm. After walking a mile he would become completely exhausted, and there would be an aching pain in the lumbar region. Family history quite free from similar complaint.

On admission there were no cranial nerve defects. Motor system: Flaccid partial paraplegia of the legs; there is present fair but limited movement in hip and knee; movement of flexion and abduction better than of extension and adduction. No movement in ankles, but slight movement in toes of right foot. Right limb is a little stronger than left. There is symmetrical wasting of muscles of lower extremities with fibrillary tremors. Electrical reactions show slight contraction to faradism in adductors of leg and hamstrings. Other muscles show reaction of degeneration. The upper extremities have escaped. No sensory loss could be detected. No sphincter loss. Reflexes: Knee-jerks; ankle-jerks absent. Plantar gives no response. Other reflexes quite normal.

(*March* 22, 1917.)

Case of Amyotonia Congenita.

By F. E. BATTEN, M.D.

W. S., AGED 3. Seventh member of S. family. Appeared normal at birth. Bottle-fed. Has never got on, and now, at the age of 3, is unable to walk. Family history: Father and mother healthy. Eldest child, girl, died at the age of 5 months. Second, girl, aged 10, healthy. Third, stillborn. Fourth, fifth and sixth, Alfred, Grace and Ettie, all affected. Seventh, patient. Eighth, baby, aged 1½, healthy. Tiny, sallow child, large abdomen and undeveloped limbs. Power very feeble, marked hypotonus. No paralysis. Liver and spleen enlarged. Deep reflexes present when in health.

(*March* 22, 1917.)

Case of Myasthenia Gravis.

By F. E. BATTEN, M.D.

L. B., AGED 13, schoolboy. Four months ago was knocked down at school and bruised his face. His speech became "peculiar" immediately afterwards, and has become progressively worse. He now complains of tightness of the tongue. No trouble with biting or swallowing. Previous history: Old perforation of right tympanic membrane. Family history, *nil*.

On examination, face expressionless and sleepy. Palpebral fissures very small, ? ptosis. Orbicularis palpebrarum and ocular muscles good. Slight weakness of orbicularis oris. Bilateral atrophy of tongue. Palate moves fairly well. Larynx: Lax cords but no paralysis. Power of limbs very fair, but muscles tire easily. Sensation: Reflexes and fundi normal. He is said to be of average intelligence, but somewhat backward at school.

(*March* 22, 1917.)

Case of Huntington's Chorea.

By E. FARQUHAR BUZZARD, M.D.

W. C., AGED 34, ex-soldier. Irregular movements of feet and hands started one year ago while patient was in hospital at Cairo for a septic finger. He pulled faces, dropped things, and walked as if drunk. Previous history: Platelayer on railway; no infectious illness; temperate. Family history: Father is in an asylum for Huntington's chorea; grandmother died of chorea.

On examination: Irregular, inco-ordinated movements. Mental condition: Not highly intelligent, but no obvious signs of degeneration.

(*March* 22, 1917.)

Internal Hydrocephalus (?).

By E. FARQUHAR BUZZARD, M.D.

A. C., MALE, aged 8. Irregular athetoid movements began after an attack of diarrhœa eighteen months ago. He was brought to hospital because he had "no control over the use of his hands and walked catching one foot in the other." He is a sallow, quiet boy. Slight involuntary movements of fingers and toes are present when patient is at rest. On performing voluntary movements everything appears to be done backwards. Movement is slow and creeping; hands are carried in position of extreme pronation. He walks clumsily, with toes turned in. Muscular power good; no sensory defect; all deep reflexes absent. Plantars flexor, abdominals active. Appears to be of average intelligence.

(*March* 22, 1917.)

Neuritic Type of Progressive Muscular Atrophy (Charcot-Marie-Tooth).

By E. D. ADRIAN, Captain R.A.M.C.

W. S. B., AGED 26, driver in A.S.C. At the age of 9 he had an attack of weakness of the legs which confined him to a chair for six months. Recovered and played football when aged 16, but had to give it up as it made his legs weak. A few years later noticed increasing weakness of the legs and some blunting of sensation as high as the knees. His weakness varies; sometimes he feels quite strong, especially in the summer months. He has had difficulty in getting up after he has fallen down. Rejected four times on trying to enlist. Has been employed as motor ambulance driver for the past eight months and able to do his work.

In February, 1917, severe cold, pain in the legs, and loss of power. Admitted to hospital and improved.

Present condition: Upper limbs and trunk well developed; legs generally wasted and flabby, but below the knee the legs are very thin. There is considerable general weakness in all the muscles of the lower limbs, most pronounced in the anterior tibial and peronei. The patient, when placed on the floor, is quite unable to get into the erect position. He stands with a wide base and knees slightly bent, and walks with a high-stepping gait. Reflexes: Tendon-jerks all present; plantars not obtained; sphincters normal. Sensation: Considerable blunting of sensation in both legs below the knees. Electrical reactions: The muscles all react normally.

Section of Obstetrics and Gynæcology.

President—Dr. G. F. BLACKER.

(*October* 5, 1916.)

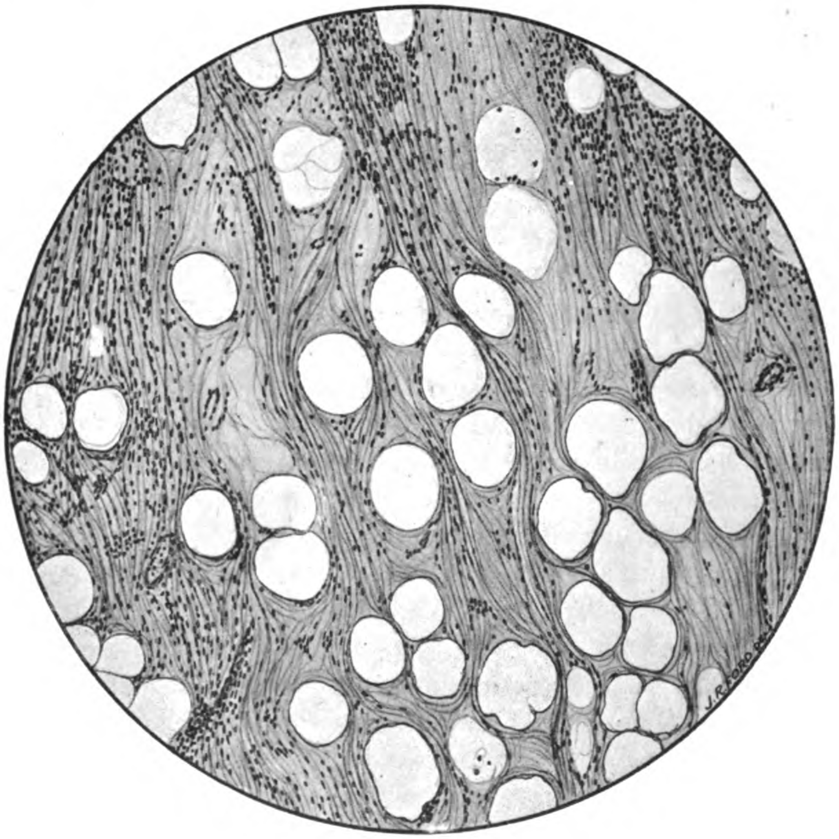
Fibrolipoma of the Right Broad Ligament weighing 13 lb.

By WALTER S. A. GRIFFITH, M.D.

M. N., AGED 57, was admitted to Martha Ward, St. Bartholomew's Hospital, in May, 1916. Family history, nothing important. Menstruation began at the age of 13, and ceased at the age of 40; duration four to five days; average quantity. Four pregnancies: three children, one miscarriage fourth month; no complication. No bowel troubles; micturition lately frequent, urine normal; no vaginal discharge. She has lost weight considerably. When menstruation ceased seventeen years ago she noticed some enlargement of the abdomen and thought herself pregnant, and from that time she has suffered abdominal pain though not continuously. There has been some prolapse of the uterus since that time.

The abdomen was found to be considerably distended by a tumour on the right side, and by flatulent bowel on the left. The tumour was elastic and tender, and extended from the pelvic brim to the right costal margin in front of the right kidney. The cervix, enveloped in the everted vagina, protruded from the vulva when straining; the tumour can be felt at the pelvic brim and was thought to be ovarian.

Operation, May 29, 1916: The tumour was found to be retroperitoneal, extending from the right broad ligament to the lower surface of the liver; it occupied the whole right half of the abdominal cavity, and extended beyond the middle line into the left half. It had stripped off the peritoneum of the abdominal wall posteriorly and on the right side in the course of its growth up from the pelvis. The peritoneal capsule in the middle line was incised over its middle third by a vertical incision, and the tumour was gradually enucleated from above downwards, and its vessels, when necessary, were ligatured. The lower part was enucleated from the right broad ligament, exposing the right side of the uterus down to the cervix, the chief vessels being secured here. The large cavity in which the tumour lay soon contracted, and was gradually closed by catgut purse-string sutures which stopped the oozing; and the abdomen was closed without drainage. The uterus, ovaries and tubes presented normal senile characters.



Fibrolipoma of broad ligament. Groups of large fat-cells in connective tissue; many deeply-stained rod-shaped nuclei indicate the presence of unstriped muscle-fibres.

The patient made a quite uneventful recovery, and left the hospital on July 14.

The tumour weighed 13 lb., and presented the yellow translucent character of a lipoma. One half is preserved for the museum at St. Bartholomew's Hospital, the other was presented to the Royal College of Surgeons, there being no specimen of the kind in the museum. Sections show groups of large fat cells surrounded by connective tissue, the nuclei of which stain deeply with hæmotoxylin. In some places the fat cells predominate, in others the connective tissue. There are also many rod-shaped deeply-stained nuclei, indicating the presence of unstriped muscle fibre.

Lipoma of the broad ligament appears to be very rare. Many writers do not mention them, and so far the author has not met with a description of one. Pozzi,[1] in his "Treatise on Gynæcology," states that he has seen one case only which was mistaken for an ovarian tumour; the patient died suddenly three days after an exploratory puncture. Sir F. Treves[2] removed one weighing 4½ lb., also from the right broad ligament. No details were given. The specimen is in the London Hospital Museum.

Subperitoneal lipomata arising in the posterior portion of the abdominal wall near the spinal column are less rare, and several cases are recorded. Their removal or attempted removal has often been followed by fatal results.[3]

(*October* 5, 1916.)

Large Ureteral Calculus removed by Abdominal Section.

By HUBERT ROBERTS, M.D.

F. S., AGED 30, married; two children. There is history of trouble with the right kidney since the age of 7. She has been in several London hospitals from time to time at ages of 17, 22, and 25. She has also been X-rayed and examined under chloroform. The diagnosis was evidently either stone in the right kidney or tuberculosis; at one hospital she was treated with tuberculin. The most notable symptoms have been pain in the region of the right kidney and ureter, accompanied with attacks of "cystitis" and hæmaturia.

The patient has been under my care for the past two years. She was first seen at the Samaritan Hospital in 1914, where she was sent by Dr. Pelly, of Highgate, on account of a lump on the right side of the pelvis. She was then pregnant six months. The diagnosis made was that of a ureteral calculus or a tuberculous gland (calcified). The mass seemed to be the size of a large walnut. The urine at the time was clear, but contained albumin and a few pus cells. I decided to watch the case and advised her to come to me for her confinement at Queen Charlotte's Hospital. This she did, and she was delivered normally of a living child on June 23, 1914. The lump never moved; it did not seem to interfere with the passage of the head. Forceps were not used. We were not able to feel the right kidney.

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[1] "Treatise on Gynæcology" (Translation), New Sydenham Society, 1893, iii, p. 123.

[2] *Trans. Clin. Soc. Lond.*, 1893, xxvi, p. 106.

[3] Doran, *Trans. Obst. Soc. Lond.*, xliv (1902), 1903, p. 265.

I saw no more of the case till June 9, 1916, when she was re-admitted to the Samaritan Hospital for severe pains in the right side of the abdomen and in the rectum and for frequent micturition. The water on examination was clear but rather scanty. The mass to the right of the cervix was much as before, very hard, quite fixed, and high up in the right fornix of the vagina. It was very painful to the touch. The bladder sound and cystoscope revealed nothing. The diagnosis of ureteral calculus was again made, and I decided to try to remove it by abdominal section. This was done on June 12, 1916.

I made a median incision of some length in order to get a full view of the pelvis. On inspection, the right ureter was at once seen. It was enormously distended and very thick. It was of the size of two fingers and felt like a thick hose-pipe. It was considerably thicker than the patient's aorta. Deep in the pelvis in the huge ureter I could feel the stone exhibited. It was quite fixed in a sort of pouch, just at the base of the bladder. I clamped the ureter easily just above the stone and then cut down on it. The walls of the ureter were very thick; on my dislodging the stone much foul urine escaped. After cleansing the field of operation I was able to sew up the ureter, then a parametric layer, and finally the peritoneum of the posterior surface of the broad ligament. Fearing possible extravasation of urine if the stitches did not hold, I opened Douglas's pouch, using the instrument shown (a very useful one), invented by Wallace, of Liverpool. The abdomen was then closed in the ordinary way. I was very interested to know what the urine in the bladder would be like after removal of the stone, so a catheter was passed soon after the patient was put to bed. It was very putrid and contained pus and blood and débris of all sorts; previous to the operation the urine was clear.

The patient made an excellent recovery, the highest temperature being 102·2° F. on the fourth day. She got up on the sixteenth day and left the hospital on the third week after the operation. The condition of the urine gradually improved and she passed, on an average, 60 to 70 oz. *per diem* just before leaving the hospital. The tube and plugging in Douglas's pouch were removed on the fourth day. There was never any extravasation of urine noticed, so I conclude my stitches held. I saw her on October 3, 1916, when she was quite well. There is still some thickening of the right ureter to be felt *per vaginam.*

Report.—The stone exhibited weighs over ½ oz. (275 gr.)—i.e., 4 dr. 35 gr. It measures 1 in. long, ¾ in. thick, 1¼ in. circumference. Chemical analysis shows the outside layers to be composed entirely of phosphates. As the central portion has not been examined, I cannot report on the composition as a whole. The calculus has a curious shape rather like a Hotchkiss gun bullet definitely pointed at its lower end—i.e., towards the bladder—and flattened on its upper part. The circumference is rounded and gives a good idea of the amount of distension of the ureter in which it lay.

I have only met with one other case of ureteral calculus. This occurred eleven years ago, also at the Samaritan Hospital. The patient refused operation, but subsequently was admitted to the Middlesex Hospital under Sir Henry Morris, who removed a large "date-stone" calculus from the right ureter by "the sacral extra-peritoneal" method. The patient had a fistula for some weeks, but ultimately recovered. I was present at the operation.

I have ventured to show this specimen as ureteral calculi are rare. The majority form in the renal pelvis, as in my case. Sometimes ureteral calculi form around a foreign body such as a silk stitch. Impaction usually takes place (if the stone is not passed) at the outlet of the renal pelvis, at the pelvic brim, or at the entrance of the ureter into the bladder. Ureteral calculi are very rarely bilateral, and are usually single. Most of the stones reported are "date-stone" in shape.

Choyce[1] reports stones weighing 816 gr. (Bloch), 803 gr. (Carless), and 780 gr. (Federoff). In most cases the kidney above is hydronephritic. Ureteral calculi give rise to severe attacks of colic, repeated at frequent or long intervals, ending only when the calculus is expelled into the bladder; after some hours or days the calculus may be discharged from the urethra. Stones in the lower part of the ureter may be felt *per rectum* or *per vaginam ;* sometimes cystoscopy will even show the tip of a stone projecting into the bladder. Kelly uses wax-tipped ureteral bougies which show scratches on the wax when a calculus is present. Radiography should always be employed in diagnosis.

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[1] "System of Surgery," 1912, ii, p. 843.

Treatment.—From the small experience of two cases I can say little. Apparently small ureteric stones are passed from the female bladder with less trouble than from that of the male. Diuretic drugs may help sometimes in lessening or dissolving calculi. Operation seems to be needed with all large stones that become impacted in the ureter, as the condition leads to anuria, infection, or dilatation and destruction of the corresponding kidney. The ureter may be exposed either near the kidney, the brim of the pelvis, or at its entrance to the base of the bladder. The operation may be extra- or intra-peritoneal. Some stones have been removed by the vaginal route,[1] or a sacral-extraperitoneal route, similar to Kraske's operation. The drainage of Douglas's pouch may or may not have been necessary, but I thought it a safeguard.

I used the intra-peritoneal abdominal method as in my case it seemed to give the best exposure of the calculus and greater freedom for subsequent technique.

I append a list of references which may be of use to those who wish to look up this interesting subject.

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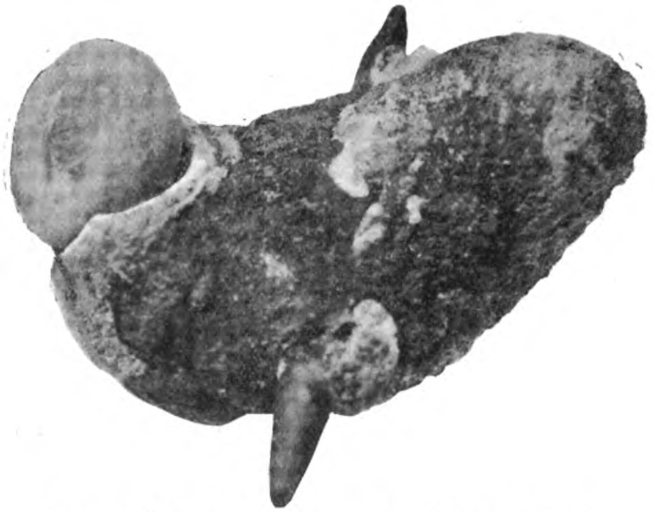
(*October* 5, 1916.)

Large Vesical Calculus, 3½ oz., around a Slate Pencil.

By FRANK BELBEN, F.R.C.S.

(Communicated by HUBERT ROBERTS, M.D.)

PATIENT, a girl, aged 17, complained of inability to hold water. Her illness began two years ago with frequency of micturition and pain during the act. She at first denied having at any time introduced anything into the urethra. Pain had been less during the last six months. She was pale and thin, and her face was covered with acne. Ammoniacal urine, containing blood and pus, constantly dribbled from the



Large vesical calculus, 3½ oz., around a slate pencil.

urethra. An anæsthetic was given, but the beak of the cystoscope impinged on some hard substance, and could not be introduced. A rounded mass was felt bimanually. Suprapubic cystotomy was done, and the two stones were removed with a good deal of difficulty, as the bladder was completely contracted round them, and the ends of the slate-pencil were embedded in its walls. On being shown the specimen the patient admitted that in consequence of irritation she had introduced the slate-pencil into the urethra nearly two years ago. It had slipped in, and she was afraid to tell anyone. Convalescence was interrupted by what was apparently a sharp attack of left renal colic, accompanied by hæmaturia. She was again cystoscoped, but no stone was seen, and the bladder appeared normal. A radiograph of the kidney also proved negative. She was discharged quite well; the acne had entirely disappeared, though there had been no treatment for it. I think the small stone probably set up the bladder irritation, and that it was to relieve this that the pencil was introduced.

(*October* 5, 1916.)

Three Ureteral Calculi removed by Abdominal Section.

By CUTHBERT LOCKYER, M.D.

THE patient from whom the first calculus was removed was a married woman, aged 38. She was sent to me in March, 1905, on account of attacks of severe pain in the right iliac and lumbar regions, accompanied by menorrhagia and leucorrhœa. She had been married for five and half years, and had one child aged 4½. The pain of which she complained started behind, and its maximum intensity was felt over the centre of the right iliac crest; it radiated round to the front to another spot of maximum intensity which corresponded with McBurney's point. It was first noticed in 1903, two years before I saw the patient. It came on in definite "attacks," and these had become progressively frequent until finally they were of weekly occurrence. The onset of an attack was occasionally accompanied by sickness; the pain was relieved by rest in bed. On examination no tumour could be felt. The uterus was bulky, the cervix deeply torn on the right side, and the right ovary was enlarged and tender. I advised admission to hospital, but the patient, who superintended a laundry, said she could not leave her work, and I lost sight of her for some years. On May 16, 1911, she was again sent to me by her doctor with a letter saying he found "a distinct tumour, which is freely movable and appears to be rapidly increasing. . . . In all probability it is ovarian." The patient now complained of a continuous heavy pain in the right iliac fossa, and of a swelling in the abdomen, which caused her "to alter her dresses." She had been a widow for four years; the periods were still excessive; there was still much leucorrhœa; the bowels only acted with aperients. *Micturition was normal.* A tumour was present in the right lumbar region, which descended on inspiration, and was diagnosed as a renal new growth. On May 22, 1911, I operated through an incision in the right *linea semilunaris.* A stone was found in the upper segment of the right ureter; the kidney, which was enlarged, was drawn up into the wound and incised, the stone was "milked" into the open pelvis of kidney and removed. The renal incision was closed by interrupted catgut sutures and a rubber drainage tube inserted into the loin. The stitches were removed on May 29. No urine ever escaped from the drain in the loin. Convalescence was uneventful, and there has been no further renal trouble. A letter received from the patient in September, 1916, states that she is now in perfect health. The stone, a typical uric acid calculus, measures 1 in. by ½ in. In shape it resembles a plum-stone, its surface is irregular and furrowed, and its colour is dark brown.

The remaining two calculi which were situated in the lower segment of the ureter, close to the bladder, were removed from a patient, aged 63, during an operation for a uterine fibroid and a solid ovarian tumour. The stones had obstructed the right ureter, and this duct was the size of a segment of small intestine. The patient had suffered from bacilluria, which vaccines failed to relieve. The entire ureter was excised after clamps had been applied to its upper and lower ends. The right kidney was left *in situ.* A perinephric abscess developed, due to soiling of the perirenal fat with foul urine, which escaped from the upper cut end of the ureter. The abscess was opened and drained. The patient then made an uninterrupted recovery. This case has already been reported in full in the *Proceedings* of this Section as one of double ureter.[1]

The two calculi are phosphatic. Dr. Foster Morley has reported that they contain no uric acid.

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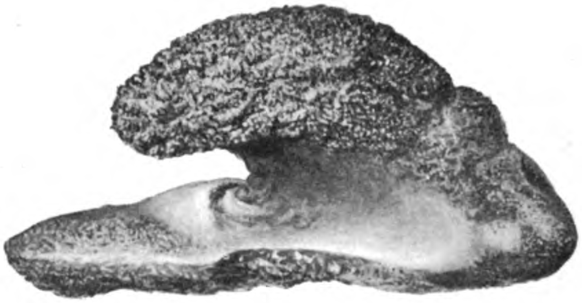
[1] *Proc. Roy. Soc. Med.*, 1915, viii (Sect. Obst. and Gyn.), p. 47.

(*October* 5, 1916.)

Recto-vaginal Calculus: a Ureteral Injury.

By CUTHBERT LOCKYER, M.D.

THE calculus shown in the figure was extracted from a woman from whom I removed the uterus, a portion of the rectum and a segment of the vagina. This operation was performed on November 28, 1913, for what I took to be a malignant growth. The case was published in the *Proceedings*[1] as an adenomyoma of the recto-vaginal septum. The patient subsequently developed a ureteral fistula, and she was re-admitted into the Samaritan Hospital on July 14, 1914, for incontinence of urine. The calculus, now exhibited (*see* figure), was found lying astride the recto-vaginal septum, with one cusp occupying the disused bowel and the other lying in the vagina. The stone was removed in two sections, both being withdrawn *per vaginam*. Subsequently ureteral catheters were passed and urine was found to issue from the right ureter and none from the left duct. The latter was ligatured through an incision in the right loin and the leakage through the vagina ceased. Unfortunately urine began to escape through the loin-wound, which had to be freely drained. Finally the left kidney was removed through a lumbar incision; after this the patient made a good recovery.



Recto-vaginal calculus (natural size).

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[1] *Proc. Roy. Soc. Med.*, 1915, viii (Sect. Obst. and Gyn.), p. 47.

(*October* 5, 1916.)

Large Vesical Calculus removed through a Vesico-cervico-vaginal Fistula.

By CUTHBERT LOCKYER, M.D.

THE calculus, now exhibited, was removed on November 28, 1910, from the bladder of a multipara eleven months after the last confinement. The clinical history is as follows: Patient, aged 38, married twelve years; five children, no abortions. The last confinement fourteen months ago. All labours were instrumental. On October 16, 1909, labour-pains began at 9 a.m. Delivery by forceps was carried out at 2 p.m. Incontinence of urine commenced the same day. There was no *post-partum* hæmorrhage. Dr. Bell, of Luton, tried to close a fistula on the ninth day of the puerperium. Twelve days later (November 4) the patient was admitted into the Bute Hospital, Luton, because the first operation had not been successful. Two subsequent attempts at closure also failed, and the patient was sent to me on November 26, 1910—eleven months after the third operation. She was then wearing a rubber urinal; the buttocks were excoriated and bathed in foul urine. The perineum was sound. Large masses of phosphates hung on strands of silk from the roof of the vagina. The anterior wall of the cervix was lacerated for a distance of 1½ in. in the vertical line, with the posterior wall of the cervix forming the floor of a large vesico-vaginal fistula. The laceration in the floor of the bladder admitted three fingers easily; it extended above for about 1½ in. above the cervical tear. On November 28 I removed the lumps of phosphatic deposit adhering to the edges of the fistula, and after cleansing the parts, the bladder was separated from the anterior wall of the cervix and the latter was sutured by four interrupted thick catgut sutures. The bladder was then separated from the vaginal wall and from the lateral connective tissues. A large calculus measuring 5½ in. in circumference was then withdrawn through the rent in the bladder; the latter was very contracted and its cavity seemed to be about the size of the phosphatic mass which occupied it. When fully exposed the vesical tear was seen to be circular in front and tailed off into a linear wound above. The mucous membrane was nearly ½ in. thick and intensely congested. Redundant mucosa was cut away and the thick œdematous fibro-muscular wall was pared with a fine fistula-knife and brought together by interrupted catgut sutures. The deep lateral recesses between the bladder and pubic rami were closed by mattress-sutures of catgut passed through the retracted pubo-coccygei muscles and through the central line of the bladder-wall. The bladder was then sewn to the cervix by catgut. The vaginal flaps were now reduced to a suitable extent, and then united across the middle line, whilst their lower ends were united to the cervix to form a ⊥-shaped scar. Interrupted fishing-gut sutures were used for this, and between these stitches a drain of bismuth gauze was inserted. A self-retaining catheter was placed in the bladder.

On December 9, eleven days after the operation, sterile milky water introduced *per urethram* was seen to escape through the external os uteri. The bladder was again separated from the cervix and from the vagina. A fistula which admitted *one* finger was found; its edges were freshened and then united with catgut. This time the bladder was not sewn to the cervix but a gauze drain was inserted into the vesico-cervical interval. The fistula closed, and the patient writes annually to say she is in good health.

DISCUSSION.

Mr. DOUGLAS DREW: There is an interesting point which Dr. H. Roberts has mentioned—namely, that so large a stone did not cause any difficulty in delivery. My suggestion is that possibly the stone slipped up into the dilated ureter above. I here show a specimen of a ureteral stone, over 1 in. in length and about as thick as the little finger, which I removed by the ilio-lumbar incision. The interesting feature of the case was that the stone, although tightly impacted in the ureter, could not only be drawn down by the finger into the vagina, but it could also be pushed up so that the fingers on the abdomen could be placed below it, showing how very mobile the ureter may be when it contains an impacted stone. It is my experience that before a stone reaches so large a size the ureter is liable to become fixed to surrounding structures owing to periureteritis being set up.

Dr. HUBERT ROBERTS: The following are short notes of a curious case which I was called to see ten or eleven years ago at the request of Dr. Stanley Box, of Ealing. It was that of an old lady, aged 70, who had a horrible discharge and incontinence both of fæces and urine. On examination, a large hard mass was found in the vagina the size of a cricket ball, and in its centre the steel ends of a forgotten Zwancke's pessary. The mass was very foul, and tightly wedged in the roof of the vagina. The patient thought a pessary had been placed there over twenty-four years ago. All ordinary efforts to remove the calculus with gynæcological instruments failed so I was forced to use some heavy tools from my motor car (boiled of course). With the help of these I broke up the calculus and removed the pessary piece-meal. One wing had entered the bladder and the other the rectum. The operation was a severe one but the patient ultimately did quite well. I rang up Dr. Box on October 2, 1916, to inquire about the case and he informed me that the lady was still alive and well (now aged 80), and that both the fistulæ had eventually closed.

(*October* 5, 1916.)

Concealed Accidental Hæmorrhage with Intraperitoneal Bleeding.

By ARTHUR J. MCNAIR, M.D.

MRS. A. K., aged 34, 6-para, was admitted into Guy's Hospital on May 12, 1916, from the Maternity Charity. Mr. Bellingham Smith kindly permits me to publish these notes. Five previous gestations terminated naturally at full term. Her present pregnancy, which was at the thirty-fourth week, had been complicated by the occurrence of profuse uterine hæmorrhage at the third month. This bleeding persisted for four days, but then ceased, and did not recur. She had also, in March, vomited a large quantity of blood on two occasions.

On the morning of the day of admission she arose from her bed to prepare breakfast, and was immediately seized with agonizing pains in her abdomen. She fainted, but soon recovered consciousness, and the pain became less. On again attempting to leave her bed, however, later in the day, she was once more attacked with griping abdominal pain, which gradually became continuous and more severe. She stated that the pains were quite unlike the pains of labour, and that there had been no "show." It is, perhaps, worthy of mention that on the previous day she had carried a child, aged 3, to the hospital and back.

On admission she was blanched, her skin was moist with perspiration, her breathing was rapid and restrained, and her pulse was feeble and irregular. Her uterus, the fundus of which reached to the ensiform cartilage, was of woody hardness; there was no alternation of contraction and relaxation. Pain was intense, and palpation of the abdomen was scarcely tolerated. The fœtal head could be felt at the pelvic brim, but no other fœtal parts could be distinguished, nor could the heart-sounds be heard. On examination *per vaginam* the cervix was found one-third dilated, the membranes were intact, and the head was very firmly engaged in the third vertex position. There was no trace of hæmorrhage.

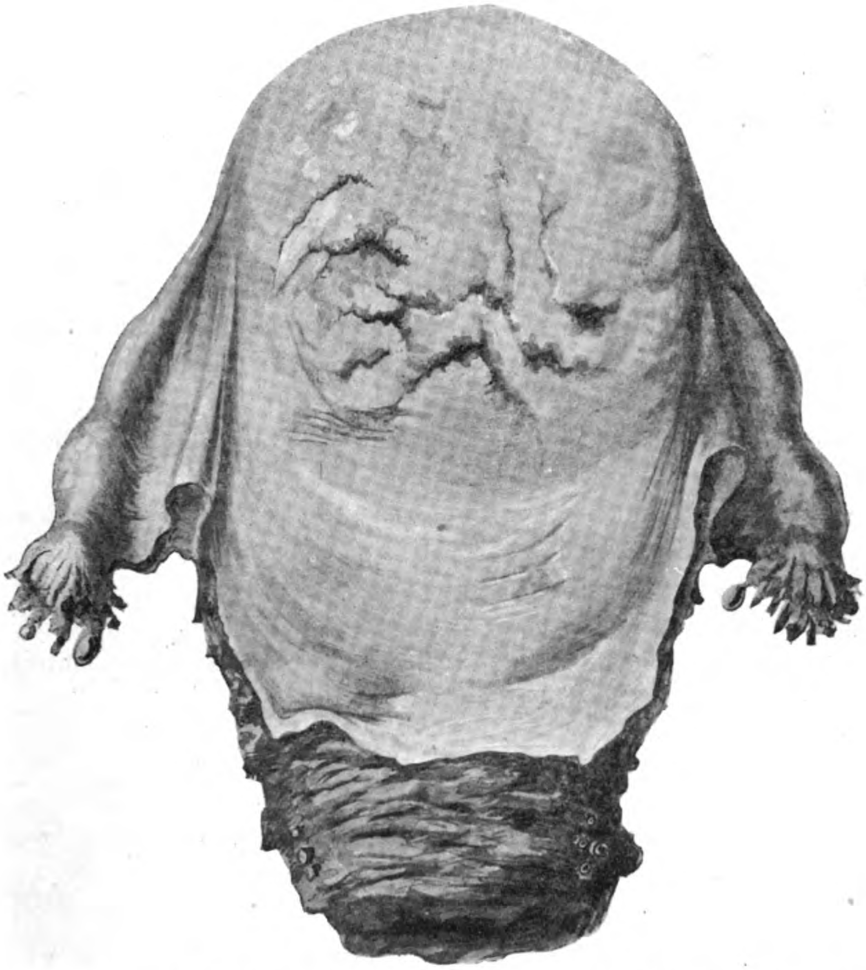
Having made a diagnosis of internal hæmorrhage I decided to empty the uterus at once, as the woman's condition was becoming progressively more serious. Cæsarean section was considered, but as the cervix was partially dilated, and did not seem to be unduly rigid, delivery *per vias naturales* was thought to be the more favourable method.

The patient was transferred to the theatre, where intravenous saline infusion was begun. Under ether anæsthesia the cervix was manually dilated with ease, and the fœtus, 5 lb. in weight, was delivered with a cranioclast. During the dilatation of the cervix the membranes were ruptured, and, on displacement of the head, the pulseless cord was prolapsed by a forcible gush of amniotic fluid untinged with blood. When dilatation was nearly completed blood escaped from the uterus for the first time. As soon as the head was extracted the placenta, which was completely detached, presented, and was delivered with the body. This was followed by the discharge of a large quantity of blood, mostly recently clotted. The amount was estimated at 3 pints. A hot intra-uterine douche was given, and pituitrin was injected. The uterus retracted perfectly, and subsequently there was only a negligible amount of hæmorrhage. Urine, obtained by catheterization, contained a trace of albumin, but no casts were detected in the centrifugalized deposit. The placenta was normal in every respect: there were no areas of infarction.

The patient was back in bed in twenty-five minutes. Saline infusion, which had been given intravenously to the extent of 2½ pints was continued subcutaneously. She was suffering from severe shock and collapse, but during the next three hours her condition materially improved. Half an hour later, however, she became uncontrollably restless, complained of pain in her abdomen, and died rather suddenly.

At the autopsy the peritoneal cavity was found to contain 24 oz. of recently shed blood, the source of which was evidently the uterus. The uterus was preserved for further investigation. All other organs were anæmic, but apparently free from disease.

The specimen consists of the uterus with a small part of the vagina attached. On its anterior surface are a number of lacerations, some of which are mere fissures of the serous coat, whilst others penetrate more deeply into the uterine muscle. The right half of the posterior wall has been removed to show the placental site, which occupies a position on the anterior wall corresponding with the situation of the superficial tears on its exterior. A deep furrow runs vertically across the placental site. Numerous subserous hæmorrhages can be seen, while in the line of section patches of hæmorrhagic infiltration can be detected.



Concealed accidental hæmorrhage. Uterus seen from in front showing peritoneal lacerations.

Microscopical sections show areas of interstitial hæmorrhage, separating apparently healthy muscle fibres. No excess of elastic tissue is demonstrable, nor is there an unusual amount of white connective tissue.

Superficial laceration of the uterus has been described in a number of cases. Braxton Hicks [2], reading a paper before the Obstetrical Society of London in 1861, mentioned several recorded instances of this complication of concealed accidental hæmorrhage, and gave particulars of a case which had occurred in the Guy's Maternity Charity. In his case, however, no blood had escaped into the peritoneal cavity. Recently the condition was reviewed by M. Fraipont [3], who described a case in many respects similar to the subject of this communication. He laid stress upon the association of peritoneal tears with the condition which Couvelaire had designated as "apoplexe utéro-placentaire." Shannon [4], Clifford [1], and Fletcher Shaw [5] have published notes on similar cases. The last-named found areas of extravasated blood in four out of five uteri, which had been removed for concealed hæmorrhage. In no instance have I found reference to an internal tear such as can be seen running across the site of placental attachment in my specimen. These lacerations may logically be assumed to result from sudden over-distension of the uterus. I can bring forward no additional evidence as to the causation of this catastrophe, a question which has been the source of much controversy. Whitridge Williams [6] has dealt with the subject of premature separation of the placenta in uteri extensively infiltrated with blood. He gives details of searching histological investigation of two uteri, and appends a full bibliography of the whole subject.

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[4] Shannon. *Glasgow Med. Journ.*, 1912, lxxvii, p. 290.

[5] Shaw, Fletcher. *Journ. Obst. and Gyn. Brit Emp.*, 1914, xxvi.

[6] Williams, Whitridge. *Surg., Gyn., and Obst.*, 1915, xxi, pp. 541-554.

(*October* 5, 1916.)

Acute Toxæmia of Pregnancy, with Acute Nephritis and Accidental Hæmorrhage; Cæsarean Hysterectomy; Recovery.

By Carlton Oldfield, F.R.C.S., and Reginald G. Hann.

A woman, aged 38, married nine years, expected her first confinement about August 8. Her pregnancy was uneventful until a few days before the sudden onset of her illness, when she had noticed transient swelling of the feet and face and some abdominal pain. She attached no importance to these symptoms and went about as usual, and was not seen until urgent abdominal pain began about 9.30 p.m. on June 16. The pain was severe and continuous and was localized to the region of the urinary bladder. She did not appear ill and the uterine muscle was slack, painless, and apparently unaffected. No other signs or symptoms were present. At 11 p.m. her condition had altered seriously. The pain was very severe and involved the whole uterus, which was tender and tense; it never relaxed. She had lost half a pint of blood from the vagina. There was no trace of dilatation of the os. Accidental hæmorrhage was diagnosed. At 2 p.m. she was seen by both of us. There had been no further loss of blood. Her face was blanched and a little puffy. She was restless and had sighing respirations; the pulse was 110 and of good quality. She complained of abdominal pain and she had headache and almost complete blindness. The extremities were rather cold.

Abdominal examination: The uterus was very tender and firm. No fœtal outline could be detected, but the muscles of the abdominal wall became rigid whenever the uterus was palpated. Now and again the patient cried out on account of exacerbations of the abdominal pain and it was noticed that she made no bearing down efforts and that the uterus did not become harder or alter in any way during these attacks.

Vaginal examination: There was blood-stained vaginal discharge continuously dribbling away. It was watery blood rather than blood-stained fluid and contained a few small clots. The cervix was quite closed and no fœtal part could be made out through the fornices.

Urine: By means of a catheter 1½ oz. of blood-stained urine were withdrawn. It was loaded with albumin.[1]

DIAGNOSIS AND TREATMENT.

From the shock, severe abdominal pain, the firm and tender uterus, which had increased in size since first seen by one of us four hours before, and the bleeding from the vagina, we felt fairly confident that the case was one of accidental hæmorrhage. The blindness, headache, scanty urine, accompanied by slight œdema of the face, however, pointed no less clearly to a toxæmic condition.

With regard to the treatment, we were in some doubt as to the best course to pursue. While we had been convinced long ago from a careful consideration of the subject that the graver cases of accidental hæmorrhage, in which the cervix is closed, are, generally speaking, best treated by Cæsarean section, we hesitated to carry out the operation immediately because of the severe toxæmia which co-existed with the accidental hæmorrhage and also because the patient did not appear to be in danger from the hæmorrhage alone. We came to this conclusion because her pulse was not very rapid and because we thought the pallor and restlessness were probably due as much to shock as to hæmorrhage, for the uterus was not much enlarged and no great amount of blood had been passed by the vagina. We decided, mainly because of the toxæmia, to watch the patient for a while and we did not interfere with her in any way. A binder was applied to the abdomen, hot bottles were put in the bed, and drinks of water were freely given to satisfy the thirst.

We remained in the house and saw her every hour or so during the night. The abdominal pain persisted, and blood continued to trickle steadily from the vagina. The toxæmic symptoms did not alter, but there were no convulsions nor marked drowsiness. The pulse varied from 100 to 120 and did not deteriorate in quality. The skin became warm and moist and at 7 a.m. her general condition was considered, if changed at all, a little better. The external os was still quite closed and no urine had been passed. We now came to the conclusion that the least dangerous course to pursue was to deliver by Cæsarean section, for while the hæmorrhage and toxæmia remained the same the shock was less severe.

The patient was accordingly removed to a neighbouring nursing home and at 9 a.m., on June 17—i.e., about twelve hours after the first symptoms appeared—the operation was done. When the abdomen was opened the uterus presented a remarkable appearance. It was purple in colour, and there were innumerable small subperitoneal ecchymoses. When the uterine wall was incised, the cut surface was also purple in colour. There was very little oozing from it and no spurting vessels. The uterine cavity contained a good deal of old clotted blood in some watery fluid, the dead child (eighth month) and the placenta entirely detached from the uterine wall and also from its membranes. After these mixed-up contents had been evacuated the uterus was drawn out of the abdomen. It was now observed that the ecchymoses not only involved the whole of the uterus, including the cut surfaces, but the appendages and broad ligaments extending on to the bladder and outwards as far as the cæcum on the right and the mesosigmoid on the left side. The uterine muscle was so broken up by hæmorrhages that it seemed very unlikely material for suturing and on this account in addition to the well-known danger of *post-partum* hæmorrhage occurring, it was decided to remove the uterus. This was done just above the level of the internal os. The cervical stump was sutured by interrupted sutures and the peritoneal surfaces apposed in a similar manner. The abdomen was closed in the usual way. For the hysterectomy part of the operation the patient had been in the Trendelenburg position.

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[1] The urine examined at intervals during the first three months of pregnancy was free from albumin.

Her appearance now was satisfactory and her pulse not different from what it was before operation. A small quantity of ether had been sufficient to maintain a satisfactory anæsthesia. She was kept in the Trendelenburg position on the heated table of the operating room and 3 pints of saline solution were injected under the breasts. Her condition remained good for the five hours she was kept in this position in the theatre. She was now transferred to bed. In a short time she became collapsed with marked restlessness and with uncountable and often imperceptible pulse. In spite of the usual restorative treatment this condition continued for eight hours, after which she rallied a little. She had a good night after being given morphia, and next day, June 18, had a pulse of 140 and still looked very ill. No urine was passed spontaneously and less than 1 dr. withdrawn by catheter. Her face was œdematous, but the legs and feet were clear. She was almost completely blind. She now complained of an uncommon symptom which we do not remember having met with before and which we cannot explain. Couvelaire, who has described a very similar case to this, records the same symptom. It was severe epigastric pain, apparently like cramp, and brought on whenever she had a drink. The patient nevertheless took large quantities of fluid. Four drams of urine were withdrawn by catheter in the evening.

June 19: A little better; epigastric pain nearly gone; sight almost normal; perspires freely. No urine passed, but constant dribbling of fluid fæces due to saline purgative. Marked œdema of face still present; feet and legs became œdematous.

June 20: Restless night; had no morphia; sweating very freely; passed urine for first time since illness began, 2 oz.; considerable œdema of lower limbs noticed.

The following report on the patient's urine was received from Dr. Gruner:—

"The deposit in this specimen contains a very large number of squamous epithelial cells and cellular detritus, also much amorphous granular matter. The casts present are all of the granular or hyalo-granular variety. Small epithelial cells of various forms are also numerous; these include tailed cells belonging to stratified epithelium, presumably of either the renal pelvis or the ureter. They are too small for the lower urinary passages, although some larger forms also occur which may be derived herefrom. There is hardly any urea present, and the phosphate and chloride excretion is very low. There is no indican. (Albumin copious.)"

June 21: 3 oz. of urine withdrawn by catheter; respirations shallow; patient slept all yesterday and to-day.

June 22: Sweating; less œdema; blood in urine.

June 23: Eyes examined under homatropine. No details in retina to be distinguished—nothing beyond red homogeneous field; disks themselves very small; edges ill-defined as though encroached upon by swollen retina. No hæmorrhages; no detachments. Sight apparently almost normal again. Urine less deposit.

June 24: First marked improvement. Œdema of face in the morning soon goes off; considerable œdema of feet and legs continues.

June 25: Urine copious, colourless, and opalescent; albumin, pus and detritus.

June 27: Considerable bruising about the abdominal incision, dating from operation; patient constantly drowsy. Very little œdema left.

July 2: Urine, specific gravity 1008; trace of albumin; no œdema anywhere.

July 5 : No albumin.

[From this date convalescence was steady and uninterrupted.]

August 10 : Looks perfectly well and has no symptoms. Ophthalmoscopic appearances normal.

REMARKS ON THE CASE.

There are three points to which we wish to draw attention :—

(1) The association of the acute and severe renal affection with the accidental hæmorrhage.

(2) The apoplectic condition of the uterus, the appendages and broad ligaments.

(3) The treatment by Cæsarean hysterectomy.

(1) *The Association of the Acute and Severe Renal Affection with the Accidental Hæmorrhage.*—It is now well recognized that albumin is frequently found in the urine of patients who have accidental hæmorrhage. The case we have described is exceptional in that the renal lesion was so acute and severe that the patient had symptoms resembling the premonitory symptoms of eclampsia and almost complete suppression of urine for thirty-six hours, followed by a period of three or four days during which the urine was scanty, colourless and nearly free from urea. An exceptional case of this character not only emphasizes the connexion between accidental hæmorrhage and albuminuria but leads to speculation on the relationship between the two conditions. Is albuminuria a cause of accidental hæmorrhage? Is it the result of accidental hæmorrhage or are both conditions manifestations of a general toxæmia? We are inclined to favour the latter explanation and think that our case lends support to that view. Accordingly we would suggest that accidental hæmorrhage be added to the list of the clinical forms of toxæmia of pregnancy.

(2) *The Apoplectic Condition of the Uterus and of the Appendages and Broad Ligaments.*—This lesion suggests to us that the hæmorrhage commenced as a capillary hæmorrhage due to the toxæmia, and that from the eruption of the subplacental tissues lacerations in the large blood sinuses were produced ending in free hæmorrhage between the uterus and the placenta, with detachment of the placenta.

(3) *The Treatment by Cæsarean Hysterectomy.*—Many cases of accidental hæmorrhage are very slight and are not diagnosed until after labour. In the common type of case the symptoms are not severe and puncture of the membranes will usually stop the bleeding.

In the severer and rarer forms of the disease the treatment depends largely on the condition of the cervix. If the cervix is dilated or dilatable the problem of the rapid evacuation of the uterus is simple. When, however, the cervix is closed in a severe case of accidental hæmorrhage, surgical intervention seems to be called for. In primiparæ, especially when the pregnancy is near full term, vaginal Cæsarean section is often difficult to carry out satisfactorily. The abdominal operation is a better procedure because the principles of surgery—viz., hæmostasis and asepsis can be more completely carried out; and further, when hysterectomy follows, the raw surfaces can be more thoroughly closed in by the abdominal than by the vaginal operation.

With regard to the question as to whether the uterus should be removed in severe cases of accidental hæmorrhage, probably no rule can be formulated, but we can hardly imagine that any surgeon would hesitate about removing a uterus which presented such a disorganized appearance as the organ with which we had to deal.

DESCRIPTION OF SPECIMENS DEMONSTRATED.

Uterus and the appendages: They are of normal size and conformation. Patchy effusions of blood are seen under the peritoneum. Cut surface of uterus is black from similar ecchymoses.

Placenta: Without membranes; half of it is blood stained; half is not; no infarcts.

Fœtus: Eighth month; the only abnormalities observed are chocolate colour of intestines, effusion of blood into subperitoneal tissue and of blood-stained fluid into peritoneal cavity. Liver and spleen appear to be normal.

Microscopic sections of (1) uterine wall: Extravasation of blood into the muscular wall separating and breaking up the muscle bundles. (2) Placenta: Nothing abnormal observed. (3) Liver of child: Some round celled infiltration of perivascular tissues.

(*October* 5, 1916.)

Cæsarean Section and Hysterectomy for Accidental Hæmorrhage.

By W. FLETCHER SHAW, M.D.

CASES of accidental hæmorrhage are classified according to their symptoms as "concealed" or "apparent," but a much more practical classification, so far as treatment is concerned, would be into two groups with "contractile" or "non-contractile" uteri. Fortunately the former class is much the more common, and includes not only the cases with a comparatively small amount of hæmorrhage, but those in which the hæmorrhage is severe but responds to treatment. If the vagina is tightly plugged or the membranes are ruptured, a tight binder applied, and ergot or pituitrin given, the uterus in this class of case will contract and prevent any further serious loss of blood, but in the second class, fortunately comparatively rare, no treatment has the slightest effect on the uterine muscle which remains flabby and bleeding. Extraction of the child by the vagina or by Cæsarean section still leaves the uterus relaxed, and the only hope of saving the woman is the rapid performance of hysterectomy. Every experienced obstetrician must have had many of these cases, and must have recognized the utter futility of treating them on ordinary lines, the patient rapidly sinking from loss of blood and often dying while the operator still continues his manipulations.

Targett, in 1905, described a case of this nature which he had saved by Cæsarean hysterectomy, and he also mentions the two points I wish to emphasize, the presence of albuminuria and the occurrence of hæmorrhages under the serous coat of the uterus.

Amand Routh, in his exhaustive paper on "Cæsarean Section in the United Kingdom," published in 1911, mentions three cases treated by Cæsarean section and hysterectomy, and considers that hysterectomy should follow Cæsarean section in those cases sufficiently severe to require this operation.

Lequeux, in 1910, advocated hysterectomy after Cæsarean section for accidental hæmorrhage in those cases "in which the uterus is a potential danger, either as a cause of secondary hæmorrhage or possible infection, however slight."

Phillips, in 1912, published an account of successful Cæsarean section and hysterectomy carried out in a severe case of accidental hæmorrhage.

Shannon, in 1912, published an interesting case in which he performed this operation, and found multiple small ruptures of the uterus, though he does not state whether there was free blood in the peritoneal cavity or no. He considers these ruptures to be due to over-distension.

Clifford, in 1914, published a case of accidental hæmorrhage treated by Cæsarean section and hysterectomy, in which he found free blood in the peritoneal cavity. This case and two of the cases I now publish, with free blood in the peritoneal cavity, are, so far as I can find in the literature, unique in this respect.

I have now performed this operation upon six patients, in none of whom did the uterus make the slightest attempt to contract after Cæsarean section had been performed, and, in five of these cases, inspection of the uterus showed such extensive extravasation of blood that we could hardly expect complete recovery of the uterus even if the hæmorrhage had been controlled.

Most of the authors I have quoted advocate hysterectomy for concealed accidental hæmorrhage, but of my six cases only one was a case of pure concealed accidental hæmorrhage, the other five all having a large amount of apparent hæmorrhage.

Case I.—This patient, aged 40, was admitted to St. Mary's Hospital, Manchester, on April 22, 1914. She was nine months pregnant with her thirteenth child, and the urine was solid with albumin. She was sent to the hospital because of severe hæmorrhage, for which a doctor had plugged the vagina with gauze. On admission the gauze was removed, the membrane ruptured, and a tight binder applied. Labour pain soon commenced; there was no further severe hæmorrhage, and in three hours a dead male child was delivered. The placenta was delivered very soon after the child. This was followed by some large clots and then free hæmorrhage. Hot intra-uterine douche, ergot and pituitary extract were given, and the excessive flow of blood arrested, though a slow trickle of blood persisted. The patient was now very collapsed, and the pulse-rate had risen to 120. Three hours after delivery the resident obstetrical surgeon gave another intra-uterine douche, packed the uterus with gauze, injected another dose of pituitary extract, but still this trickle of blood persisted. I was sent for seven hours after delivery, and found the patient very collapsed, with an uncountable flickering pulse and a persistent trickle of blood from the vagina. I gave another hot intra-uterine douche but this had no effect upon the hæmorrhage, though the uterus was apparently contracted. The cervix was not lacerated and from the whole of its internal surface, as far as it could be seen, blood was oozing, and presumably this was happening all over the uterine cavity. I had the patient taken to the theatre and opened the abdomen, in which I found about half a pint of free unclotted blood; both broad ligaments were very much swollen and almost black in colour from very large effusions of blood in the loose cellular tissue, the one on the right being the most extensive and reaching above the brim of the pelvis. The back of the uterus had several slight abrasions on it from which the free blood in the peritoneal cavity had come. I did a panhysterectomy, sutured the opening in the vagina, the round and infundibulo-pelvic ligaments, and covered them with peritoneum. I had great difficulty on the right side in controlling the hæmorrhage from some small vessels ruptured high in the pelvic tissue, as the ends were lost amongst the disorganized cellular tissue, and I had to insert several ligatures round bunches of this tissue before the vessels were satisfactorily controlled. At the end of the operation I found I was perilously near the ureter, but the patient's general condition was so serious that I considered it better to run this risk than to spend any more time over the operation. After the operation we kept the patient in the theatre in the Trendelenburg position for some hours and gave intravenous saline. The patient picked up wonderfully, but only passed 9 oz. of urine in the first twenty-four hours, though the amount of albumin had considerably diminished. In the next fourteen hours she passed 20 oz. of urine, and after this a normal quantity each day, albumin not being present after the fourth day. Three days after the operation diarrhœa commenced, consisting of very offensive watery material containing undigested milk. This diarrhœa continued in spite of treatment until death took place from exhaustion three days later—that is, six days after the operation. During the whole of this time the patient was bright, had no headache or visual disturbances, passed a normal quantity of urine, with a gradually diminishing amount of albumin which completely disappeared after the third day. The temperature was intermittent to 100° F. and once to 101·4° F., and the pulse varied from 100 to 140. There was never any rigidity of the abdomen. At the post-mortem examination there was a small amount of clear fluid in the peritoneal cavity. The intestines were much injected and contained very foul, thin, watery yellow material. The right ureter was caught in a ligature and was distended, as was also the hilum of the kidney. Both kidneys were apparently healthy, both on macroscopic and microscopic examination. The abdominal and pelvic wounds were quite healthy. The lungs were very œdematous but there was no consolidation. The heart was normal.

Specimen: The uterus is enlarged and has been completely removed by panhysterectomy. It is of a deep red, almost black, colour all over except for a V-shaped area on the anterior and posterior walls. This discoloration, and that of the broad ligaments, which have shrunk very much in the preservative solution, is due to extravasated blood. On the posterior surfaces are several cracks not extending much deeper than through the peritoneal coat. The section through the tissues shows several patches of extravasated blood; these are chiefly in the superficial layers under the peritoneal coat. There is a considerable increase of fibrous tissue but very little increase in the amount of elastic tissue.

[This case was published in the *Transactions of the North of England Obstetrical and Gynæcological Society*, 1914.]

Case II.—M. E. B., aged 41, was admitted to St. Mary's Hospital on February 3, 1915, for severe hæmorrhage. She was seven months pregnant with her seventh child, and there was a considerable amount of albuminuria. The hæmorrhage commenced suddenly at 7.10 a.m., but she was not sent to the hospital until almost midnight. She was then very collapsed, with a pulse of 144 and temperature of 96° F., and the uterus was the size of full-term pregnancy and very tender. She was immediately taken to the theatre and Cæsarean section with hysterectomy was performed. There was about half a pint of free blood in the abdominal cavity and a very large hæmatoma in the left broad ligament. The right broad ligament contained no blood. The uterus was filled with clotted blood, amongst which was the completely detached placenta and a dead child. She made a perfectly good recovery.

Case III.—M. E. H., aged 38, eight and half months pregnant with her eleventh child, was admitted to St. Mary's Hospital on August 28, 1915. There was a considerable amount of albuminuria. This patient was seized with sudden severe abdominal pain at 2 a.m. whilst in bed. She sent for the midwife but though in a collapsed condition she was not sent to St. Mary's Hospital until ten hours later. On admission the patient was very blanched and collapsed, with sighing respiration, and a thin uncountable pulse. The uterus was distended, very tender and there was no sign of external bleeding. She was immediately taken to the theatre and Cæsarean hysterectomy performed, while at the same time intravenous injection of saline was given. The operation only occupied fifteen minutes, but the patient died fifteen minutes later. The uterus was distended with blood and the placenta was completely detached. Both broad ligaments were enormously distended with large hæmatomata, but there was no free blood in the peritoneal cavity. This patient was moribund on admission, but it was decided to perform the operation and give her the only chance, though a slight one, of recovery.

Case IV.—S. N., aged 32, eight months pregnant with her ninth child, was admitted to St. Mary's Hospital on September 15, 1915. There was a large amount of albumin in the urine. Severe hæmorrhage commenced suddenly while she was in bed early in the morning, and she felt faint. The hæmorrhage slackened a little, but continued all day, and she was sent to the hospital at 4.30 p.m. On admission she was very pale, pulse 140. The uterus was the size of full-term pregnancy, hard and very tender. The cervix admitted two fingers, but the external hæmorrhage was not severe and no placenta could be felt. Cæsarean hysterectomy was performed. The uterus was full of clotted blood ; the placenta was entirely detached and the child was dead. The woman was so anæmic that there was no bleeding from the uterine incision. There was no free blood in the abdominal cavity, but there was a very large hæmatoma in the left broad ligament and a smaller one in the right. It was only with the greatest difficulty that the bleeding could be controlled on the left side, as the vessels were lost in the blood-clot, and the tissue as high as the third lumbar vertebræ had to be ligatured in the hope of catching all the vessels. The operation was done as rapidly as possible, but the patient's pulse could not be felt at the end of the operation. She was kept on the operating table in front of a large fire, intravenous infusion of saline given, and also pituitary extract. She gradually recovered, and eventually made a perfectly good recovery.

Case V.—H. H., aged 41, seven months pregnant with her ninth child, was admitted to St. Mary's Hospital on September 15, 1915. There was a large amount of albuminuria. Hæmorrhage commenced suddenly at 4 p.m. with severe abdominal pain, and she was admitted to the hospital three hours later. There was then free external hæmorrhage; the cervix admitted one finger; the uterus was hard, large and very tender; the patient was collapsed and the pulse uncountable. Cæsarean hysterectomy was performed soon after admission. The uterus was filled with masses of blood-clot, the placenta completely detached, and the child was dead. There was a large hæmatoma in the right broad ligament, but none in the left, though the hæmatoma on the right side did not extend over the pelvic brim as occurred in some of the other cases; there was much difficulty in controlling the oozing of the thin watery blood, but the operation on the whole was much easier than some of those just reported. This patient made an uninterrupted recovery.

Case VI.—M. R., aged 39, eight months pregnant with her thirteenth child, was admitted to St. Mary's Hospital on September 23, 1915. There was much albuminuria. Severe external hæmorrhage commenced in the afternoon, and a district nurse who saw her sent her to the hospital at once. On admission her general condition was fairly good, pulse 126, and temperature 98·2° F. The resident obstetrical surgeon ruptured the membrane, applied a tight binder, and gave pituitary extract, but no contractions of the uterus occurred, and the hæmorrhage continued. Later in the evening I was sent for, and did Cæsarean hysterectomy. There was no free blood in the peritoneal cavity, and no hæmatoma of the broad ligaments. The uterus was full of blood-clots and the placenta was completely detached. The uterus made no attempt to contract after extraction of the child. This operation was performed much more methodically than any of the foregoing as the patient was in a much better general condition, and two ligatures were placed round each uterine and ovarian artery. At the end of the operation she was in a fairly good condition, with a pulse of 120. Six hours later she was restless and cold, with sighing respiration, but her pulse was only 110, so we looked upon her condition as one of shock. Very soon afterwards she died. Post-mortem examination showed that the ligatures round the right uterine artery had slipped and the patient had bled to death, though we had been misled as to her condition by the pulse-rate not increasing.

The operation performed in each case, except the first, was Cæsarean section through a longitudinal median abdominal and uterine incision. After extraction of the child, the round and infundibulo-pelvic ligaments on both sides were seized with pressure forceps and cut, the utero-vesical peritoneum incised, the uterine arteries on both sides seized and cut and then the cervix cut across about the level of the internal os. After the cervix had been sutured and the uterine arteries and the round and infundibulo-pelvic ligament ligatured, the cut edges of the peritoneum were drawn over the raw surface of the cervix and broad ligaments, and the abdominal wound closed in three layers. This is one of the operations in which time is an essential factor, every minute saved, in some of the cases, being of the greatest importance: one of the operations was completed in fifteen minutes, though needless to say, no time was lost in peritonizing the pelvic wound and in stitching up the abdomen in layers.

All these six cases were of the severest type of accidental hæmorrhage, and would undoubtedly have died if they had not been operated upon. They were all suffering very severely from the effects of the hæmorrhage, and in none of the cases did the uterus show the slightest sign of contraction after removal of the child, so there was no option but to follow the Cæsarean section by hysterectomy. The final result was three deaths and three recoveries, but one of the deaths was due to the accident of a slipped ligature, which has only once previously occurred to me, and this case I believe would have been saved if I had opened the abdomen again. I thought, however, she was suffering from shock, as her pulse-rate did not increase; at the end of the operation this patient was in a much better general condition than any of the others.

With regard to the other two deaths, one patient was practically moribund at the time of admission, and I only did the operation in the very faint hope that she might be saved; she survived the operation only a quarter of an hour. This patient was sent to the hospital ten hours after the onset of symptoms and her life would almost certainly have been saved if the midwife had realized the gravity of her condition earlier. The other death took place six days after the operation with the symptoms of toxæmia. A mortality of 50 per cent. is extremely high, but the patients representing the other 50 per cent. would undoubtedly have died if the operation had not been performed. As was to be expected all the children were dead, the placentæ being completely detached.

The outstanding feature of these cases was the condition of the uterus; all, but one, containing large hæmatomata of one or both broad ligaments, in some cases extending far above the pelvic brim and, in two of the cases, the condition had extended so far that the peritoneum had cracked and free blood had been poured into the peritoneal cavity. In the first case—the patient operated upon for hæmorrhage after the birth of the child—the uterus had been douched and massaged frequently, and it is possible the lacerations on its surface and the hæmatomata in the broad ligaments may have been caused by trauma, though it had not been treated more vigorously than many uteri which have symptoms of *post-partum* hæmorrhage. Of the remaining five cases, four had large hæmatomata in the broad ligament and one of these also had free blood in the peritoneal cavity; no treatment had been attempted in the case of these patients before the abdomen was opened, so the hæmorrhage must have been due to some local condition of the uterus or some general condition of the patient.

None of the six cases I now record had the slightest chance of surviving had not the operation been performed, as not one of the uteri made the slightest effort to contract, except the first, and that maintained a persistent trickle of blood which almost killed the patient. But the condition found at the operation, hæmatomata of the broad ligament and free blood in the peritoneal cavity, quite unsuspected previously, should induce us to consider whether some of the less severe cases would not be better treated by Cæsarean section, followed by hysterectomy if necessary, than by the more conservative methods.

PATHOLOGY.

All these uteri show an increased amount of elastic and fibrous tissue, especially around the blood-vessels, but not more than is usually found in multiparous uteri. Apart from this I can find no change, except extravasated blood in the uterine wall, more marked in the superficial layers, especially under the peritoneal covering. Couvelaire considers this a constant feature in accidental hæmorrhage, but we must look upon it as the result of the condition, not the cause. In these cases the condition had gone much further; not only was the blood extravasated into the uterine wall, but it had extended into the broad ligaments to form large hæmatomata, and in two cases had broken through the peritoneal covering of the uterus, and had trickled into the peritoneal cavity.

Another constant feature was the presence of albuminuria. This occurs in the great majority of cases of accidental hæmorrhage, and I find it exceptional to meet with a case, slight or severe, in which this condition is not present.

The older teaching was that accidental hæmorrhage was due to an accident, and I well remember, as a student, being warned not to allow pregnant women to do any work which necessitated the arms being raised above the head, such as the lifting of plates from a shelf, &c. It is very exceptional to see a case even remotely connected with an accident, and a large proportion commence to bleed during the night while in bed.

We must look much deeper to find the cause of this condition. In my opinion it will be found in some general condition of the patient, probably a toxæmia. My chief reason for this belief is founded on the large number of patients with accidental hæmorrhage who have albuminuria which entirely disappears a few days after confinement, not persisting as it does in cases of chronic nephritis.

This, of course, opens up a wide field for research, but when the toxin or toxins are found which produce eclampsia, acute yellow atrophy of the liver, hyperemesis gravidarum and chorea gravidum, it is more than likely we shall find them present in cases of accidental hæmorrhage.

Note.—I wish to emphasize that I only advocate Cæsarean hysterectomy for those severe cases which will not respond to ordinary methods of treatment, but remain flabby, relaxed and bleeding.

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DISCUSSION.

Dr. AMAND ROUTH: It is interesting to note that, in 1,280 cases of Cæsarean section collected by me from obstetricians living in Great Britain and Ireland in 1910, only four such operations had been performed for concealed accidental hæmorrhage—namely, by Bagot of Dublin, Briggs of Liverpool, Targett of London, and Savage of Birmingham, with two recoveries. I think if there is evidence of continued concealed hæmorrhage which does not yield to treatment, the abdomen should be opened and Cæsarean section performed, and if, owing to absence of retraction, hæmorrhage persists, subtotal hysterectomy should be performed. I believe that the epigastric pain to which Dr. Oldfield has referred is due to the associated toxæmia, of which condition it is a frequent symptom in severe cases.

Dr. HERBERT SPENCER: This meeting will probably mark a stage in the history of accidental hæmorrhage, the communications on intraperitoneal and intraligamentary hæmorrhage being of great importance. The ecchymoses and intramuscular hæmorrhages are not at all rare; I have seen them at post-mortem examinations of puerperal uteri of toxæmic patients and others. Some of them appear to be due to pressure on the uterus by the attendant; in some of the cases shown they seem to be due to overstretching of the uterus. Pure concealed accidental hæmorrhage (in which not a drop of blood escapes from the vagina) is extremely rare; in thirty years I have only seen one instance of it. In that case I did conservative Cæsarean section, notwithstanding the presence of ecchymoses and intramuscular hæmorrhages, and the patient made a simple recovery. These slight hæmorrhages in aseptic cases form no indication for the removal of the uterus, and even the more extensive intraperitoneal and broad ligament hæmorrhages might, perhaps, be treated more quickly and simply by drainage than by hysterectomy. If, however, the uterus is removed—and I do not go so far as to say it is never necessary—the organ should be removed by total hysterectomy and the vagina left open for drainage. I think Dr. Oldfield's case, in which severe epigastric pain occurred after food, may be regarded as an exaggerated example of the epigastric pain so frequently met with in the toxæmia of pregnancy.

Mr. H. BRIGGS (Liverpool): I share, with others present, the keen appreciation of the papers just read. The pathological evidence, still incomplete, enforces an open mind as to treatment. The possible distribution of the hæmorrhage encourages abdominal section, but hardly justifies the removal of an organ itself only participating in a morbid manifestation. The broad ligament hæmorrhage is not due to extraneous pressure as I thought possible in 1904, when I had its naked-eye appearances copied by an artist after the death of a patient treated by a tight abdominal binder and vaginal tampon (the water-colour drawing is produced). The intraperitoneal hæmorrhage, apart from actual uterine rupture, has been associated with uterine peritoneal fissures. Is it conceivable that high intra-uterine tension may establish a Fallopian tube as a conduit of blood from a concealed uterine accidental hæmorrhage? Early this year, when an acute abdomen complicated a labour with a dead fœtus near the full term, there developed an intraperitoneal effusion of 3 pints of liquid blood, which were drained by abdominal section twelve days after the labour. The extraneous side of the question was revealed in the patient's previous history of treatment for gastric ulcer in a general hospital. The matting of the undilated left Fallopian tube on the lower portion of the retro-omental blood sac was suggestive, but too inconclusive, for an obstetrical debate. Whitridge Williams has recently fully discussed the eclamptic state as a cause of accidental hæmorrhage. In the treatment of severe cases of accidental hæmorrhage I have been driven to regard active surgical effort as promoting the tide against the patient. In the light of to-night's proceedings further trials must be made; more work and more evidence are required.

Mr. G. F. DARWALL SMITH: I have come across one case of free intraperitoneal bleeding associated with concealed accidental hæmorrhage, but before I relate it perhaps I may be allowed to state the reasons which influenced me in treating it in the way I did. When I was a student I was struck with the fact that in more than one case of concealed accidental hæmorrhage death occurred a few hours after delivery *per vias naturales* when delivery had been hastened, even though the uterus retracted well and there was no *post-partum* hæmorrhage. Later, I was also struck by the fact that a woman may be in a profound state of shock and collapse, due to concealed accidental hæmorrhage, even though there is no more than about half a pint of blood in the uterus, and scarcely any has been lost externally.

These considerations seemed to point to the woman's condition being due, not only to collapse from loss of blood, but also to nervous shock associated possibly with the sudden distension of the uterus. A patient in a condition of shock, as distinguished from collapse due to bleeding which is still going on, is not in a good condition for a severe abdominal operation. Hence, it seemed that, if the bleeding could be controlled temporarily while she recovered from the shock to some extent, it would be safest to allow her to deliver herself, either naturally or with artificial help, when her general condition had improved. In one case I attempted to eliminate the element of shock by spinal anæsthesia, but unfortunately, as sometimes happens with this method, the shock was definitely increased for a short time, though the woman eventually delivered herself naturally and safely. Generally speaking, I have adopted the method of combating the initial shock, which was, I think, first proposed and practised in Canada, by the use of morphia and saline infusion, at the same time attempting to control the hæmorrhage by vaginal plugging and pituitary extract or ergot, with or without rupture of the membranes. And my efforts have been attended generally with success, but I have come to realize that there are two conditions which may let one down badly when this method is adopted: one is intraperitoneal bleeding, and the other is extensive extravasation of blood into the wall of the uterus, in the presence of which nothing on earth will make it contract. Hence, I feel sure that in all severe cases in the future I shall open the abdomen without delay, but I would suggest that even then it is important to avoid adding to the shock already present by making use of local as well as general anæsthesia, which can be effected very rapidly. The history of the particular case I have to relate is as follows: The patient was a married woman who had had nine previous labours, all of which had been natural. At 11 a.m. on December 1, 1915, when near full time, she had some moderate hæmorrhage *per vaginam* and severe pain in the abdomen and she fainted. There were no labour pains. At 4 p.m. she was admitted into St. George's Hospital with a pulse of 120 and the typical signs of concealed accidental hæmorrhage. There was practically no external hæmorrhage. She was not in labour. She was treated at first with vaginal plugging, a tight binder and a T-bandage, and with morphia, pituitary extract, and subcutaneous saline, but her general condition steadily deteriorated, so I removed the uterus, unopened with the child inside it, in order to make the operation as bloodless as possible on account of her very serious condition. Normal saline was infused into the veins during the operation. The peritoneal cavity contained from 8 to 10 oz. of free blood, which had apparently come from two vertical cracks from 3 to 4 in. in length, extending through the peritoneum and into, but not through, the muscle of the posterior wall of the uterus near the fundus. There was about 1 pint of retroplacental blood-clot in the uterine cavity. The concealed blood was entirely behind the placenta, and the partial uterine ruptures were on the peritoneal surface over the placental site. There was no interstitial hæmorrhage in the wall of the uterus. The patient's condition was desperate at the end of the operation, and she unfortunately died nine hours later from hæmorrhage from a small vessel in the flap of peritoneum near the bladder, which was not oozing when the abdomen was closed but must have started to bleed when the patient's pulse improved shortly after operation.

Professor MUNRO KERR: My opinion is that while a considerable number of cases of "concealed accidental hæmorrhage" are toxæmic in origin a very large number are not. Concealed accidental hæmorrhage of a pure type is hardly ever found in primiparæ—the individuals peculiarly liable to toxæmia. Of the cases in which I have performed abdominal section I have seen two types: one, where the uterus, tubes, and broad ligaments contained numerous hæmorrhages such as have been described by the readers of to-night's papers; and another where the blood was entirely pent up between the placenta and uterine wall. It would be most unfortunate if an extreme position were adopted, and all cases of "concealed accidental hæmorrhage" labelled "toxæmic." Regarding the treatment, I am surprised that none of the authors of the papers has referred to the most important contribution to the subject made by Professor Essen Möller of Lund (Sweden). This author has shown by his recorded cases that "hysterectomy" is not necessary even although the uterine wall contains many hæmorrhages. The question of "conservative" Cæsarean section versus hysterectomy in this connexion is not, however, of much importance—it is really almost entirely academic; for after all a woman who has given birth to twelve or thirteen children, as was the case in some of the examples referred to to-night, has done so well by the family and State that the removal of the uterus is not of the same moment to her as it would be to a young woman.

Dr. HASTINGS TWEEDY: It has been a pleasure to listen to the reading of three such suggestive papers. Professor Müller first drew attention to the association of accidental hæmorrhage with the toxæmias of pregnancy. I have no doubt that hæmorrhage is often due to toxæmias, and in last year's clinical reports of the Rotunda Hospital the two conditions were associated. I agree with the writers of the different communications that concealed accidental hæmorrhage not uncommonly arises from rupture of vessels in the broad ligament and vessels on the peritoneal surface of the uterus, and when these regions are the source of bleeding there is almost always a toxic origin forthcoming. As regards treatment, I should consider these forms of toxic hæmorrhage as indications for abdominal Cæsarean section, but for all other accidental hæmorrhage I should prefer treatment by the vaginal plug, no matter whether the membranes have or have not ruptured, or whether the hæmorrhage is external or concealed. The objections to the vaginal plug arise from a faulty conception as to its mode of action. It is stated in text-books that its purpose is to well back the hæmorrhage, and to retain it within the cavity of the uterus until the pressure there equalizes the pressure in the blood-vessels. No one has ever seen the plug acting in this way, nor on its removal has more retained blood been found than can be accounted for by the amount poured out during its application. It is certain that the plug when properly applied exercises direct pressure on the uterine vessels. These vessels, running on the surface of the large spherical uterus, come into close contact with the lateral fornices. The fornices are unyielding in the unimpregnated state, due to the support they receive from the so-called Mackenrodt's ligaments. These ligaments are in reality portion of the tendinous extremities of the uterine muscle fibres. When the internal os is closed they are tense, but when the os opens in labour they become flaccid and permit the fornices to be pushed high up into the abdomen. Under the circumstances the plug can be felt above Poupart's ligament, and in this situation it is impossible to prevent it obstructing the uterine circulation. The mortality of treatment by abdominal section is at present very high, and there does not seem any immediate prospect that it will be materially lessened in the future. It at present compares very unfavourably with that obtained under use of the vaginal tampon.

Mr. T. G. STEVENS: Real cases of concealed accidental hæmorrhage are always desperate conditions, and cannot be dealt with in the same way as cases of external accidental hæmorrhage. The uterine muscle in concealed hæmorrhage is paralysed, and will continue to distend as long as blood is being poured out into it. Possibly such a uterus may gradually recover and retract after the emptying of its contents, but in the meantime further bleeding will occur which will probably cause death. I consider that in any case such a uterus is a menace to the future health of the individual, and that there need be no hesitation in performing hysterectomy, if it can be done by a shockless method of operating. It is practically impossible to guarantee that there will not be a loss of at least one pint of blood during the operation of Cæsarean section, and this amount may well turn the scale against the patient. It is my opinion, therefore, that the safest treatment is to perform hysterectomy at once, without opening the uterus at all. In one case I performed the operation with complete success. As the child is always dead in these cases the conservative operation need not be considered on its account.

Dr. FLETCHER SHAW (in reply): From the discussion upon my paper I find there has been some misunderstanding of it, as some speakers evidently thought I was advocating Cæsarean hysterectomy as a routine treatment for accidental hæmorrhage. Nothing was further from my mind. I only performed it for those cases which would not respond to the ordinary methods of treatment. Rupture of the membranes, accompanied by hypodermic injections of pituitrin or ergot, or packing the vagina tightly with gauze, cure the great majority of cases of accidental hæmorrhage by causing uterine contraction, but there remain a few cases upon which these methods of treatment have not the slightest effect; the only chance of saving the patient is Cæsarean hysterectomy. After the last case reported in this paper, eleven months elapsed before I saw another case of accidental hæmorrhage which did not respond to routine treatment, and for which I had to do hysterectomy, although I had seen many cases of accidental hæmorrhage during this time. I do not agree with Dr. Hastings Tweedy that packing the vagina is the best routine method of treating accidental hæmorrhage. I prefer rupture of the membranes, with hypodermic injections of pituitrin, but this is beside the present discussion: to avoid this side issue, and to keep the discussion entirely upon the subject of the paper, I mentioned these two methods of treatment together and as of equal importance. Dr. Herbert Spencer has raised the question of panhysterectomy as opposed to subtotal hysterectomy: this again hardly comes within the scope of the discussion, though I much prefer the latter operation as being more rapid and free from many of the objections of the former, but this would be better treated in a separate discussion. I quite agree with Dr. Spencer that pure concealed accidental hæmorrhage is a very rare condition: one of the six cases now published was of this variety; but altogether I have only seen a very few cases.

Section of Obstetrics and Gynæcology.

President—Dr. G. F. Blacker.

(*November* 2, 1916.)

SPECIAL DISCUSSION ON THE NEED FOR IMPROVEMENT IN THE CARE OF PREGNANT WOMEN.

The Need for Improvement in the Care of Pregnant Women, and a Direct Means to that End.

By S. G. Moore, M.D. (Huddersfield).

I HAVE taken the liberty of slightly extending the scope of what I wish to lay before you this evening. Permit me in the first place to direct attention to the fact that this subject is of national importance, that it is of such magnitude that it may, and ought to be, considered on national lines, and hence that we should avoid and disregard questions of local interest.

It may be the case that physicians and surgeons, whose daily work it is to deal with cases of diseases and injuries, come unconsciously to regard their presence in a community as unavoidable. But in reality they are preventable. In the absence of violent death the normal human life ought to progress from infancy, through youth, middle, and old-age, to senile decay and death. So also in the case of pregnancy. Considered strictly, discomfort, disease and death associated with childbearing are abnormal. The reproduction of the race is a physiological—not a pathological—process, but under existing conditions, in industrial England, to-day the unfortunate paido-poietic[1] expects to suffer distress and pain, and to risk death. Hence, in part at least, the reduction of the birth-rate. This aspect of the subject is important, and will repay more detailed consideration. How much of the unwillingness to bear children revealed by the falling birth-rate, is due to the fear among women of distress and suffering, and the risk of death? It cannot be measured; no figures can be given—obviously. In a volume issued by a women's social and political organization having numerous members, hundreds of "horrible examples" are furnished of the unendurable lot of pregnant women among the industrial classes. The main object of the volume is to secure amelioration, but defence of various nefarious and criminal practices is thinly veiled. Are the "horrible examples" well founded? Unquestionably so. Are they sufficiently numerous to constitute valid argument or a serious menace? The answer is doubtful; yet it is significant that the volume was issued; its source is *more* significant; and perhaps *most* significant of all is the fact that such an investigation as formed its basis was felt to be called for by those who carried it out. Examine the case from whatever aspect we may, I feel that there is substantial ground for the belief that some of the reduction in the birth-rate results from this cause.

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[1] *Paidos* = a child ; *poico* = I make.

A certain number of women seek medical help for conditions resulting from pregnancy. How many suffer but do not seek such aid? How many regard their sufferings as inevitable? Again, of all the causes and forms of death, among the most lamentable and calamitous is that of the young mother. Her removal from her family calls forth commiseration from all. When we are made aware that on an average 3,500 of such cases occur each year in England and Wales, we find that the matter is of no small moment. It is to be remembered in addition that a far greater number of women endure preventable suffering, and disablement—sometimes life-long.

In the report on the subject of "Maternal Mortality in Childbearing," by the principal medical officer of the Local Government Board (Dr. Newsholme), several considerations are set forth which demonstrate that many of these deaths are preventable. In the same report a recommendation occurs that intensive investigation of the causes thereof should be made. In the accompanying table (*see* p. 39), details of the mortality in childbed in Huddersfield are shown. The return is a compilation of the entries in the death returns for Huddersfield for *ten years and ten months*, from January, 1906, to October, 1916, inclusive. The entries in the death certificates are classified according as they fall into groups, and these groups are

DEATHS FROM PARTURITION IN THE COUNTY BOROUGH OF HUDDERSFIELD DURING THE PERIOD JANUARY, 1906, TO OCTOBER, 1916.

	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	Total	
Albuminuria and eclampsia	1	1	1	—	—	—	—	—	—	—	—	3	36
Albuminuria	—	—	—	—	—	1	1	—	—	1	—	3	
Eclampsia	—	1	7	7	1	1	3	2	5	1	2	30	
Puerperal fever	3	2	2	4	3	1	1	3	1	—	1	21	32
Septic absorption	1	—	—	3	—	1	1	1	—	2	—	9	
Peritonitis—convulsions	1	—	—	—	—	—	—	—	—	—	—	1	
Pneumonia	—	—	—	—	—	—	—	—	1	—	—	1	
Hæmorrhage	1	—	1	—	3	—	—	2	2	1	2	12	24
Placenta prævia	—	1	1	1	1	2	1	—	—	1	1	9	
Ante-partum hæmorrhage	—	—	—	—	1	—	—	—	1	—	—	2	
Retained placenta	—	1	—	—	—	—	—	—	—	—	—	1	
Cæsarean section	—	2	1	—	—	1	—	—	—	—	—	4	11
Contracted pelvis	—	—	—	1	—	—	—	—	1	—	1	3	
Parturition	2	—	—	—	—	—	—	—	—	—	—	2	
Parturition—difficult craniotomy	1	—	—	—	—	—	—	—	—	—	—	1	
Induced labour	—	—	—	—	—	1	—	—	—	—	—	1	
Embolism—pulmonary	2	—	—	—	—	—	1	—	3	1	—	7	10
Embolism—cerebral	1	—	—	—	—	—	—	—	2	—	—	3	
Ectopic gestation	—	—	—	—	—	2	—	—	—	1	—	3	3
Vomiting of pregnancy	—	1	—	—	—	—	—	—	1	—	—	2	13
Prematurity—endocarditis	1	—	—	—	—	—	—	—	—	—	—	1	
Heart disease—organic	—	—	—	—	—	—	—	—	—	1	—	1	
Purpura hæmorrhagica—abortion	1	—	—	—	—	—	—	—	—	—	—	1	
Phlegmasia alba dolens	—	1	—	—	—	—	—	—	—	—	—	1	
Ovarian tumour—ruptured uterus	—	—	1	—	—	—	—	—	—	—	—	1	
Meningitis—convulsions	—	—	—	1	—	—	—	—	—	—	—	1	
Malnutrition	—	—	—	—	—	—	—	—	—	—	1	1	
Anæmia	—	—	—	—	1	—	—	—	—	—	—	1	
Gangrenous hæmorrhoids after child-birth ...	—	—	—	—	—	—	—	1	—	—	—	1	
Cystitis, acute	—	—	—	—	—	—	1	—	—	—	—	1	
Mania	—	—	—	—	—	1	—	—	—	—	—	1	
Totals ...	15	10	14	17	10	11	9	9	17	9	8	129	

arranged in order of importance. The first group represents the deaths from albuminuric conditions; the second from septic infections; the third from hæmorrhages; the fourth from pelvic conditions; and the fifth from embolism. Thereafter the numbers become inconsiderable.

I think that the members of the Section will agree that some at least of the first and largest group need not have died had the paidopoietic come under the care of a skilled physician even a couple of months before the end of her period, while the second group, almost as important numerically, we know by experience to be entirely eliminable. How many of the cases in the third group could have been prevented it is more difficult to say, while the fourth group, though perhaps less so, still presents some doubt. The remainder are so small that they need not detain us.

I trust that enough has been said to establish the fact that many of the deaths in childbed are preventable, not theoretically, but practically and actually, as I hope to show later.

One's natural tendency when one arrives at this stage of consideration of the problem is to ascertain the influence of the nature of attendance at confinements—this is suggested in the Local Government Report: Thus if a ratio could be established between the total births attended by doctors, and the total births attended by midwives, and the number of deaths in childbed among the practice in each, it seems that some useful information might emerge. For example, if it could be shown that the death-rate was substantially heavier among persons attended by midwives than by doctors that would be an argument, perhaps, for the elimination of the former, or at least for the taking of much greater care in their training. It is not feasible to find this ratio in Huddersfield at present, and probably it is equally difficult elsewhere. Moreover I very much doubt whether it is worth the while, because I think it will be agreed that when a woman is actually in childbed, except where septic conditions are concerned, and frequently also in these cases, it is too late to save her life. Again, with the head impacted in a contracted pelvis, or in the presence of eclampsia, the condition is likely to be desperate.

A DIRECT MEANS TO SECURE IMPROVEMENT IN THE CARE OF PREGNANT WOMEN.

Proceeding on the assumption of the need for an improvement, let us consider how that can best be effected. I submit that this is not an appropriate subject for partial, tentative, and ineffective measures; the best ought to be adopted.

Some twelve years ago I saw a paragraph in one of the medical journals to the effect that in a Commune in France for ten years the infant mortality figure had been zero. I investigated the paragraph, and there emerged what seemed to me to be a plain, simple, and *unobjectionable* need—namely, that the sanitary authority should be made aware of the existence of members of the community who were dying in large numbers before their very existence in the community was known to the authorities whose duty it was to take means to prevent their deaths. I refer, of course, to infants. I introduced such a system in Huddersfield in 1905-06, and in the following year Parliament saw fit to apply that system to the whole country. To my complete surprise and substantial regret my professional brothers objected. Yet I feel sure that the historian who deals with the matter, after time has enabled an unbiased judgment to be formed, will express astonishment, not that this measure was taken, but that its absence had escaped the attention of a civilized community for so long.

In my judgment the notification of pregnancy is a strictly comparable proposition. The circumstances are parallel, mothers are dying in excessive numbers just as children died, and still die in excessive numbers, from preventable causes. The majority of them do not come under the care of a duly qualified, and legally registered, medical practitioner until their condition is desperate, and until the opportunity of taking measures to prevent catastrophe is overpast.

One hears tell of "violation of the sanctity of the home," and of "trespass on the holiest feelings of a woman." To my mind this is merely a survival of mediæval conceptions. Pregnancy cannot be concealed, and ought not to be concealed, whether it be legitimate or illegitimate, and since it cannot be concealed what valid objection is there to comply with a provision which has for its sole and exclusive object the welfare of the woman and her baby?

Let us contemplate for a moment two classes of hewers of stone, one erecting those edifices which, dedicated to the glory of God, yet remain monuments of the glorious labour of man—I refer to the temples and fanes of this and other countries; the other excavating stone in the quarries, or hewing paving stones. To which category ought medical men to belong? Voluntarily, willingly, vauntingly joining in the good work of preventing this family calamity, this source of national weakness, this discredit to medicine; or merely complying with the law of self-preservation by uncongenial labour.

I trust that the medical profession will not in this matter repeat the mistake—it was undoubtedly a mistake—into which it fell in connexion with the notification of births. Given certain conditions which are sane and reasonable, and will be agreed to by everyone—namely, that on receipt of a notification of pregnancy, if the woman be visited or examined at all she shall be visited and be examined by a duly qualified, and legally registered, medical practitioner, and secondly, given that no treatment shall be afforded by the sanitary authority, that it confine itself to its true function, the prevention of disease and death, but that each case be referred for treatment to the family doctor—I see no reason whatever why the profession of medicine should not accept generally, willingly and cordially the proposition for the notification of pregnancy.

A voluntary system of notification of pregnancy has been in operation in Huddersfield since January 1, 1916. A fee of 2s. 6d. is paid to doctor or midwife (not to others) for each notification, subject to the consent of the woman having been obtained beforehand. Each case is visited by a duly qualified and legally registered medical practitioner. No treatment is undertaken. Suitable cases are referred to the family doctor. Material aid is obtained from philanthropic persons or organizations wherever necessary. It is not furnished by the sanitary authority.

It is too soon to report conclusively on the matter, but it may be of interest to set forth the experience so far:—

PERIOD JANUARY 1 TO OCTOBER 31, 1916.

Number of births notified	1,536
Number of pregnancies notified	156
Percentage of total	10·1
Notified by doctors	8
Notified by midwives	148
Number of uncomplicated pregnancies	130
Number of complicated pregnancies	26
Percentage of complicated cases	20

Types of Complications.

Varicose veins	7
Extreme anæmia	6
Vomiting (excessive)	2
Albuminuric symptoms	2
Phthisis	2
Serious domestic difficulties	2
Hæmorrhoids	1
Contracted pelvis	1
Deformities	1
Prolapse of uterus	1
Sepsis	1

COMPARISON OF TWO CASES OF PREGNANCY SHOWING ALBUMINURIC SYMPTOMS.

Case I notified under pregnancy scheme.
Case II not so notified.

Case I.—S. M., notified under pregnancy scheme by midwife, February 2, 1916. Condition: Marked œdema of feet and legs; headache past fortnight; eyesight defective; occasional dizziness; vomiting of pregnancy troublesome. Advice: Doctor to be called in at once. February 10: Under doctor; better. March 31: Confined; healthy, full time child; placenta adherent. April 11: Mother up, anæmic; Child well, breast-fed. July 10: Mother and child well.

Case II.—H. M., not notified under pregnancy scheme; same midwife engaged. May 8, 1916: Child born; mother seized with eclamptic fit and died in infirmary; had had swollen legs, acute vomiting, and headache some weeks before confinement; " thought it normal with pregnancy and sought no advice."

One word in conclusion. The birth-rate is falling to an alarming extent. The death-rate also has fallen substantially during the past generation. There is no limit below which the former cannot be reduced, but with respect to the latter, nature does set an inexorable limit. We must remember that the death-rate in England and Wales has approached such a figure that if it falls two or three more per thousand the mean age at death will be 100 years.

The position is rapidly approaching when the population of this country will commence to decline. But the German, Austrian and Turkish nations, as well as others, are more prolific, and in the absence of war, pestilence and famine, increase prodigiously. If it be our desire and intention to prevent our descendants becoming slaves, then we must seriously take steps to prevent loss of life in every direction. No doubt these statements are familiar to all, but I think that they cannot be repeated too frequently.

The mother dying in childbed presents not only her own sad case, but from the national point of view—and I hope that no other will be considered—the surviving members of her family are rendered less efficient, they have less chance of surviving, and she has ceased to be a source, a fount and origin of defenders of the Homeland.

The Importance of getting a Pregnant Woman under Medical Supervision and affording Her the Necessary Treatment.

By AMAND ROUTH, M.D.

SOON after our Council asked me to read a short paper on this section of to-night's subject I read in the *British Medical Journal* (July 8, 1916, p. 33), an important monograph on "The Care of the Pregnant Woman" by Dr. Archibald Donald of Manchester. Personally I agree with almost everything Dr. Donald said in that paper except his three summing-up conclusions, which seem to me to oppose some of his arguments. As these conclusions appear to discountenance universal medical supervision of pregnant women, I propose to use them as a text upon which to base my remarks, for his conclusions show that the question of such supervision needs more discussion than I thought was necessary.

His first conclusion is "That the supervision of all pregnant women would mean a great deal of unnecessary trouble, as in the majority of cases in which danger threatens during pregnancy, the patient will voluntarily apply for help."

His second conclusion is that "even if supervision were greatly increased, the results in the saving of infant life would be comparatively small."

His third conclusion is that "there are more important causes of fœtal death than the diseases of pregnancy, and these would not be dealt with in a scheme of supervision during pregnancy. Under these he would mention particularly abortions and stillbirths caused during delivery."

Surely the fact that stillbirths are often due to "accidents of childbirth" as the Registrar General calls them, is no argument against the supervision of pregnant women, for such accidents are often due to undiscovered pelvic abnormalities. Nor do I see that even if "greatly increased supervision" would only result in "comparatively few" fœtal lives being saved, it is any argument against such increase of supervision, rather the contrary. Such "few lives" might include a Shakespeare or a Kitchener.

Dr. Donald's first conclusion that such increase of supervision would cause unnecessary trouble because women would come voluntarily for help in cases where danger threatens, does not seem borne out by one's own experience or by Dr. Donald's own statements. Many complications are subjectively unsuspected. Perhaps the expression "medical supervision" needs defining. It does not necessarily mean continuous or frequent interviews between doctor and patient. Primarily it means one interview and a preliminary examination of urine. Subsequent interviews and urine tests take place as the doctor thinks desirable, or when the patient notices some sign or symptom which disturbs her.

If Dr. Donald is right in saying that increased supervision is unnecessary, because its results would be comparatively small, I would ask how it is that cases for emergency Cæsarean operations for unrecognized pelvic contractions continue to be sent to our hospitals. Some of these cases, owing to previous attempts at delivery, are already septic and their mortality is high.

How is it that among the poorer classes emergency admissions to our hospitals of cases of eclampsia are still so numerous? Thus at St. Mary's Hospital, Manchester, Dr. Fletcher Shaw[1] tells us that forty-five cases of eclampsia were admitted in 1914, and at Queen Charlotte's there were nine cases in the same year. Private cases of eclampsia are rare because of the routine examination of urine, and though exceptional cases of sudden albuminuria with almost immediate eclampsia may occur, most cases have a warning albuminuria for some weeks beforehand. At Queen Charlotte's Hospital in 1914 there were 557 cases of albuminuria during labour—i.e., in 30 per cent. of the total labours, and of course many of these cases must have had albuminuria during part of their pregnancies (Queen Charlotte's Hospital Report, p. 13).

If the medical supervision of pregnant women is already sufficient, and its extension unnecessary, why should 3 per cent. of stillbirths now be notified under the compulsory extension of the Notification of Births Act? Why especially should there be so many macerated stillbirths?

In the Report of Queen Charlotte's Hospital for 1914, p. 39, it is stated that there were 100 stillbirths (5·5 per cent. of total births) of which twenty-six were macerated. By some curious error maceration appears as the *cause* of death in these twenty-six cases, and no mention is made of syphilis as a cause of death in the whole number of stillbirths whether macerated or not. Five stillbirths are stated to have been due to albuminuria and three to eclampsia. It is, I think, agreed that the large majority of macerated fœtuses are due either to syphilis or maternal toxæmia.

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[1] *Brit. Med. Journ.*, October 14, 1916.

Sir Francis Champneys, who is of course in favour of medical supervision, in a letter on "Health Visitors and Birth Inquiry Cards" in the *British Medical Journal* for September 23, 1916, p. 438, says: "It is a mistake to suppose that ante-natal care has only been discovered in the twentieth century. All careful doctors have practised it for a very long time and all careful midwives have done the same." Dr. J. W. Ballantyne's work on ante-natal pathology, and ante-natal hygiene really was a "discovery" from the fœtal point of view, although Sir Francis Champneys does not think so, and it happened to be made in the twentieth century, for Dr. Ballantyne began his prematernity work in the Edinburgh Royal Infirmary in November, 1901. In England there were no Infant Welfare or Ante-natal Clinics before 1906. Apart from hospital routine no systematic ante-natal work was started till 1911 when it was commenced in Birmingham and Leeds, and that was mainly the home visiting of expectant mothers.

There are of course many careful doctors, but even careful doctors do not always extend their care, unasked, to pregnant women or to unborn babes. Doctors must not only be experienced in recognizing the complications and diseases of pregnancy but in anticipating and treating the accidents of childbirth as well.

Midwives, although not paid for visiting their patients during pregnancy, are encouraged by the new (1916) Central Midwives Board Rules, to extend their ante-natal care to the "unborn child," for in the subjects for examination for their certificate there is now included the "Hygiene of pregnancy and its diseases and complications, including abortion, both in relation (*a*) to the mother and (*b*) the unborn child." Previously it was worded: "Pregnancy and its principal complications including abortion." This extension of interest to the unborn child will greatly increase the usefulness of the midwife, and appears to imply that she is to be trained in diseases of pregnancy, and encouraged to visit and supervise the patient and the child, during pregnancy, as well as during labour and the puerperium, though curiously enough on p. 22 of the "Rules," where the midwife's "Duties to patient" are defined, her "Duties" even now appear to begin only during the patient's labour. It is a possible danger that if midwives are to be trained in and examined on the diseases and complications of pregnancy, it may be difficult to prevent them treating such conditions, at all events for a time, instead of at once sending for medical assistance as the rules require.

Some evidence which I was able to give in an address on "Ante-natal Hygiene" early in 1914[1] pointed out that the death-rate of infants during their mothers' pregnancies was as great, or probably greater, than the death-rate amongst their survivors in the first year of life. This evidence was based on the notification of three stillbirths per 100 births, and on the estimate made by many experts that abortions and miscarriages are four times as numerous as stillbirths. If so, it means about 150,000 deaths *in utero* or during childbirth in England and Wales every year. How many of these would be saved if we could always detect syphilis and toxæmia in early pregnancy.

The fact is that the life of the infant and of the unborn babe, like silver in the time of Solomon, was of small account with a high birth-rate and a prolonged peace. Now with a small birth-rate and when mothers are mourning the loss of "only sons," and have an added and often expressed sorrow that they might have had others, the life of the child is of enormous importance, and steps to ensure maternal and infant welfare are being initiated at conception instead of being delayed till childbirth, to the great advantage of both the mother and the child. As a result of this increased interest in the unborn child a large number of ante-natal clinics and maternity centres have been instituted all over the country with the primary object of trying to save the child, but, of course, also indirectly benefiting the mother. Where the clinic has been initiated by "The Association for Preventing Infantile Mortality," presided over by Sir Thomas Barlow, or that for encouraging "Infant Welfare," or as part of the organization of Hospitals for Children, &c., it is natural that the nomenclature should be from the child's point of view rather than that of the mother, and the phrase preferred at such centres is ante-natal rather than ante-partum. There are now 750 such centres in Great Britain and Ireland.

Till a few years ago women who came to be registered for their confinement in the indoor or extern departments of many general hospitals had their names and addresses taken down by the obstetric house physician, who may have had no previous experience of the diseases of pregnancy, and often had very little spare time. It was optional to him to examine or omit to examine the patient, or to test her urine. No students used to attend this registration, for there was rarely any clinical knowledge to be gained. Now opportunity is taken to utilize the registration of expectant mothers by making it, and sometimes calling it, an Ante-partum or Ante-natal Clinic, greatly to the advantage of patients and students, and the department is usually in charge of the Obstetric Registrar or Tutor, or even of the Assistant Obstetric Physician or Surgeon.

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[1] *Brit. Med. Journ.*, 1914, i, p. 355.

Notwithstanding the conclusions which Dr. Donald drew in his paper, and which I fear may tend to check enthusiasm in ante-partum and ante-natal hygiene and care, I feel sure that he really does not disagree with me, for a most interesting account is given in the *British Medical Journal* for October 14, 1916, by Dr. William Fletcher Shaw, on "Ante-partum Clinics," as conducted at St. Mary's Hospital, Manchester, where Dr. Donald has done such admirable and well-recognized work. Every pregnant woman going there to be registered for indoor or outdoor parturition is seen by the resident obstetrical officer, who has always had previous obstetrical experience. Every primigravida and every woman with a history of a previous difficult confinement is examined by him. This is ideal supervision, and so also is the routine examination of urine as insisted upon by Dr. Donald. But Dr. Shaw adds: "It is not sufficient to have well-equipped and well-staffed maternity hospitals; the general practitioner must have practical training in the whole department of midwifery." This is the right attitude to adopt as regards supervision.

The doctor must be able efficiently to supervise his pregnant patients. Routine urine tests should always be made, and further tests made, if there is albuminuria, to decide upon its toxic origin. In addition to the necessity of ascertaining whether the pelvis is contracted, whether there are clinical evidences of toxæmia, or whether the woman is syphilitic, I will merely allude to such maternal conditions as malnutrition, Bright's disease, diabetes, heart disease, and tuberculosis, any of which should, if present, be discovered and treated. Early this year I saw a lady who was only six weeks pregnant, and thought herself well, but was already showing evidences of cardiac insufficiency. Sir James Mackenzie's advice, and he is not a pessimist, was "immediate operation for the removal of the ovum." Such cases, rare though they be, cannot be seen too early. Plumbism, perhaps due to diachylon, asthma, Graves's disease, malaria, chronic colitis, or chronic bacilluria, may also be discovered, and the mother's health safeguarded. The acute specific fevers, as well as acute pneumonia or bronchitis, or gonorrhœa acquired during pregnancy, or acute coli pyelo-nephritis, need not be here considered, for such conditions would necessarily lead to the patient coming under medical care. Mechanical abnormalities, such as retroversion of the gravid uterus, could be detected before symptoms have appeared, and sequelæ, such as impaction of the fundus uteri, abortion, retention of urine, cystitis, or sepsis, prevented. In addition to pelvic contractions and deformities, potentially obstructing fibromyomata or ovarian tumours, or cicatricial stenosis of the cervix or vagina, may each be unsuspected by the patient, but easily discoverable during early pregnancy, and may be either treated at once or left to be dealt with at a later date as may be indicated. Ante-partum hæmorrhage need not be considered, for the woman would in most cases seek medical advice, so that ectopic gestation, mucous polypi or cancer of the cervix, placental detachments, &c., would become known. Similarly, hæmorrhage due to hydatidiform degeneration of the chorion or to the presence of a carneous or blood mole would lead to a doctor being consulted.

In the later months fœtal malpositions, malformations, such as hydrocephalus, or relatively large children, all of which may be causes of "accidents of childbirth," may sometimes be discovered. The recognition, for instance, of a transverse lie early in labour or during late pregnancy, followed by appropriate treatment, would minimize risk to mother and child.

It is true that quite a large proportion of pregnant women may be seen and found healthy, and their urine may also be found to be normal, so that many of our investigations may have negative results. Even in these cases, however, a doctor rarely sees a primigravida without being able to give her some useful advice as regards general hygiene, exercise, rest, suckling, care of nipples, &c. Women also can be encouraged to attend lectures or demonstrations on the feeding, clothing, and bathing of infants, and can be usefully helped by a word of sympathy and by being assured that all is well and that there is nothing to dread. If she is poor, and is looking forward with anxiety to the financial outlook of the period of her confinement and lying-in, some practical advice, or the possibility of some assistance from charitable or municipal sources could be brought to her notice, or be definitely obtained for her.

The next question is as to how such supervision can be universally ensured. In private practice this is easy to arrange. In panel practice it can also be arranged if the panel doctor is going to attend the patient. Registration at a general hospital, infirmary, or lying-in institution will secure supervision. Midwives can encourage their patients to attend schools for mothers or ante-natal clinics in their neighbourhood, for a midwife would soon realize that she will be saved much anxiety, effort, and time, if her patient can be kept in such health that the parturition will be a normal one. The force of example will, in time, make supervision general.

PREMATERNITY BEDS.

Every maternity centre and ante-natal clinic should be linked up with hospitals where so-called "prematernity beds" or "wards" are available. Observation by experts, and medical or surgical treatment can then be carried out.

NOTIFICATION OF PREGNANCY.

If all midwives could be encouraged to take their patients to a maternity or ante-natal clinic the patients would, by such a visit, voluntarily and automatically notify their pregnancy to the doctor in charge, without any publicity whatever. This is a very different thing to *compulsory notification* of the pregnancy to the local health authorities, which could not be carried out at present owing to the ignorance of the value of obstetric hygiene among women, and because of the certain resistance of the women most concerned. Any attempt to enforce compulsory notification to the health officer or his representative would, in many cases, result in the woman putting off notification till very late, or perhaps not till her confinement, and would arrest the good progress now being made in securing medical supervision.

RESEARCH.

Research work with regard to ante-natal pathology must be associated with medical supervision of pregnant women, especially as regards syphilis and toxic albuminuria, and the effect of these complications upon the mother and the fœtus. For these and many other reasons a pathological and chemical laboratory should be provided within easy access of all groups of maternity centres and clinics in large towns. This could either be in a general or lying-in hospital, or be one of the laboratories recommended in the report of the Venereal Commission. Every fœtus, and especially every macerated fœtus, whether born before or after viability, and every ovum, however early, expelled from a woman who has had other abortions or stillbirths, should be sent to a pathological expert for post-mortem examination, and search should be made for the *Spirochæta pallida* or other cause of death. In the new (1916) rules of the Central Midwives Board midwives are instructed to keep the body of every stillborn child till the doctor has seen it.

There seems to be a tendency for some pathologists to consider that syphilis in the parents only causes fœtal disease or death in the later months. This appears to be founded upon the fact that the *Spirochæta pallida* is not found in the early fœtuses, and yet syphilitic women often have alternating abortions and stillbirths. Dr. Mott showed this conclusively in his interesting epidiascope demonstration at the discussion at this Section in April, 1914, following an address by myself on "The need for Research in Ante-natal Pathology," and those who doubt that syphilis causes abortions should read his remarks in our *Proceedings* for that month. Dr. Mott gives a table showing[1] that the wives of fifty-six tabetic men had 154 living children, seventy-three who died after being born alive, twenty-two stillbirths, and thirty-six abortions; and that of twenty-two tabetic women, four were sterile, and the remaining eighteen had sixteen living children, twelve born alive but died later, fourteen stillbirths, and thirty-two abortions. The following are two typical cases: Father contracted syphilis during wife's second pregnancy after two healthy children. She then had four abortions, an infant who lived three months, another who lived six months, then a child who became a general paralytic at the age of 14, afterwards a daughter who was then aged 12, then another abortion, and then a frail girl then aged 8. A tabetic woman (father not syphilitic) had six pregnancies, one child born dead, followed by five abortions.

If, in these cases, stillbirths are proved to be syphilitic, surely it is logical to assume that the abortions in the same women are due to the same cause, even though search for the spirochæta prove negative. Those who hold these new views admit that toxic albuminuria in pregnancy may cause fœtal death during both early and later pregnancy, and that in the later months the fœtus may become macerated. The evidence of a positive Wassermann reaction in the case of the mother, known to have syphilis, does not seem to me to be different from the evidence in the case of a woman who is known to be suffering from a toxic albuminuria. In both cases the mother has a disease which may destroy fœtal life at all stages. I cannot help thinking that the existence of spores in the life history of the *Spirochæta pallida*, as described by McDonagh, may be a possible explanation of the failure to find spirochætæ in abortions, the spirochætæ being destroyed by the ferments of the chorionic villi, whilst the spores with their stronger envelope escape.

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[1] *Proc. Roy. Soc. Med.* (Sect. Obst. and Gyr.), 1914, p. 288.

Whether, therefore, the question of medical supervision during pregnancy be considered from the point of view of the welfare of the mother and unborn child, or as an educational stimulus to the nation, or from the standpoint of the increase of pathological, clinical, and therapeutical knowledge for the profession, there can surely be no real difference of opinion that every pregnant woman should be seen by a doctor, and then have such supervision as her condition requires.

The Importance of getting Medical Practitioners and Midwives to co-operate with the Local Health Authorities.

By COMYNS BERKELEY, M.D.

IF a reference is made to the title of the subject being discussed this evening, and to the text of the three subsidiary subjects dealing with the different sections of the subject, it is evident that the members of your Council, in framing them, determined that, whatever else might happen, this should be an "evening out" for the pregnant woman, and that, so far as they could help it, her claim for better care and treatment should not escape adequate presentation and discussion for want of repetition.

I am led to make this observation from my personal opinion that, had Dr. Moore so chosen, he could have covered legitimately in his introductory remarks all the ground that is covered by the three speakers that follow him, who in their turn can hardly help enlarging on his subject. Further, I have failed to find any encouragement in the remark of several of my friends that they should be sorry in such circumstances to have to follow the medical officer of health for Huddersfield. I suppose, therefore, I must consider myself fortunate in not being placed fourth on the list, although I quite expect to find that when Lady Barrett has introduced her subject, she will be in no need of my commiseration, but need rather that I should have congratulated the Council of this Section on having the foresight to place her in this position.

The title of the subject chosen for Dr. S. G. Moore for this evening's discussion, "The Need for Improvement in the Care of Pregnant Women," suggests to my mind, among other things, that it is thought that doctors and midwives do not pay as much attention to the health of their pregnant patients as they might or can do under present circumstances. Again, the subject chosen for Dr. Amand Routh, "The Importance of getting all Pregnant Women under Supervision, and affording them Necessary Treatment," suggests that at present pregnant women are suffering at the hands of their medical attendants or midwives with respect to supervision and treatment. In either case, therefore, not having had the advantage of knowing what points these two speakers were going to emphasize, I do not deem it unnatural that I should assume, in thinking over what I was going to say, that they would be certain to touch on many points which I could have elaborated, and that, unless I was very careful, I should only be repeating many things which they had already said, and said better.

I have come to the conclusion, rightly or wrongly, after a careful consideration of the title of the subject that has been allotted to me—namely, "The Importance of getting Medical Practitioners and Midwives to co-operate with the Local Health Authorities," that I am supposed to deal with the subject of "The Maternity Centre" and its relation to the private medical attendant and the midwife. If so, I shall confine my attention principally to the ante-natal side of it.

The question of the "Maternity Centre" first came prominently before the medical profession on the passing of the "Notification of Births (Extension) Act, 1915," when the Local Government Board addressed a circular to the County Councils and Sanitary Authorities pointing out the provisions of this Act. This circular, among other things, drew the attention of these bodies to Section 2 of the Act, which enables them to make arrangements for the care of pregnant women, and the Board states that it is confident that it can rely upon the Local Authorities to make the fullest use of the powers conferred upon them in this respect, and, indeed, assumes that they will do so.

In order to encourage those Local Authorities already engaged in this work, and to stimulate others who have not yet commenced, the Government has agreed to finance any such scheme up to one half of its cost by means of annual grants. In offering to make such grants, the Board is careful to state that it will expect medical advice, and, where necessary treatment, to be continuously and systematically available to the pregnant mother, and that to enable this to be done efficiently, the Local Authorities will have to start maternity centres in populous districts.

Now, I am confident that every doctor and midwife will agree that a pregnant woman is justified in maintaining that she has a right to the greatest possible care and to the best possible treatment that medical science can give her during this important and trying time of her life, and this not only for her own sake, but also for the sake of the nation, since the child which she brings forth will, if it lives, become a citizen of that nation, and its usefulness to the State may be greatly impaired or nullified from want of care of its mother during its intra-uterine life.

The British Medical Association has passed a resolution that it is entirely in favour of any scheme which will encourage prospective mothers to arrange in advance for their nursing and medical attendance during the period of pregnancy, but evidently it is doubtful as to whether the scheme suggested by the Local Government Board is the best means of securing it. Let us see what this scheme is.

Having decided that maternity centres must be set up, it suggests that their personnel and procedure shall be as follows:—

Personnel.—The staff of the Centre is to consist of medical men or women and non-medical women, working under the direction of the local medical officer of health. With regard to the medical workers, the Local Government Board, as far as I can gather, considers that the best possible medical officer to have charge of such a centre would be a whole-time paid official.

This impression has led to the conclusion "that there would be a tendency under such a scheme to the formation of a class of practitioner who would be wholly concerned with the treatment of disease in expectant mothers and in young children, and that almost the whole of actual practice among such patients may be withdrawn from the general practitioner." Further, "if the medical and surgical treatment of the public is to continue to be (as it should be) in the hands of general medical practitioners, aided by suitable opportunities for consultative and pathological assistance, the effect of this must be seriously detrimental to public and profession alike."

If a local authority takes the line of trying to persuade all pregnant women that they need the help of some specialist (and the specialist employed by a local authority is in very many cases certain to be some young woman doctor at a salary of about £300 a year), I do not think that it is at all likely that the doctors will co-operate, but on the contrary there will lurk the danger of a tendency to make things as difficult as possible. Quite apart from the financial point of view, which must appeal to every man, even to a general medical practitioner, his exclusion from such a scheme would most certainly lessen his usefulness to the community; and it has been pointed out that if the duty is to be undertaken by a whole-time officer, such a one will lack not only the healthy experience of free practice with the stimulating competition of ideas, but also, which is more important, will be unable to obtain that free entrance to the homes of the workers which is possible to the general practitioner.

The Board is, however, very anxious that medical practitioners and midwives should co-operate in its scheme, and, quite rightly, if for no other reason than because such lack of co-operation would mean its ruin. The whole success of this scheme depends upon it pleasing the doctors and midwives. With this object in view, therefore, the Board suggests as alternatives that the head of the Maternity Centre should be a practitioner from another district—or, and this is the arrangement which it considers least satisfactory—a rota of practitioners from the neighbourhood.

The Local Government Board agrees that the work of the Maternity Centre would be most effective if co-operation is secured with midwives of the district, and thinks that the value of such a centre would be most enhanced by the co-operation of the medical practitioners, and that they should be consulted in regard to organization, and that any arrangements made should, as far as practicable, secure their approval.

In addition to the doctor or doctors in charge of the maternity centre, there are to be non-medical health visitors, and the Local Government Board lays great stress upon the importance of these workers, if the scheme is to be a success. It appears that the best possible women, according to the Local Government Board, for such posts, are trained nurses who have gained the certificate of the Central Midwives Board, and have been certified as sanitary inspectors. It is suggested that in some cases, at any rate, these health visitors should act as inspectors of midwives, and thus bring into line the hygienic advice given to the mother during or after the lying-in period. In addition, it is hoped that voluntary workers will be available.

The Work of the Centre.—The doctor will make a careful examination of the heart, lungs and kidneys of the expectant mother, and, when considered necessary, will measure her pelvis. If serious organic disease is detected, the patient will be advised to have medical aid at home, or, failing this, arrangements will be made to send her into a hospital for in-patient treatment, and in all cases, if the patient has engaged a midwife, the midwife will be informed of the state of affairs.

Any immediate treatment will be given at the centre, or by the private doctor of the patient, or by the hospital, and no responsibility will be undertaken at the centre for continuous treatment.

As the work of the centre will only succeed in producing the best results when combined with home visiting, the health visitors, or in some cases special visitors appointed for this work, will visit the homes of the patients, as often as they consider necessary, to see that the advice given has been thoroughly understood, and is being carried out in the home. It will, therefore, be necessary for the health visitor to have been present at the medical consultation at the centre.

Now, such a scheme as this, if carried out as suggested, will not, as far as I can gather, please either the doctors or the midwives. It is futile to suggest, as is suggested by advocates of the Government scheme, that the pleasing of doctors and midwives has nothing to do with the matter, and that all we are concerned with is the lowering of the mortality or morbidity of the pregnant woman. The Local Government Board is at pains to impress upon the medical profession that it is anxious to satisfy its legitimate demands. Again, what right, I should like to know, have those people who insist that the Board's scheme is the only scheme that should be considered, to assume that they are the only people who know what is good for the community or who have its interests at heart?

The scheme of the Local Government Board, unless it is properly safeguarded, will in the long run vitally alter the status of the profession, and the relation between doctor and patient, to the detriment of both. Such a scheme would have a tendency to eliminate the "family doctor," who is the best person to give advice to his patients and to treat them. Again, the tendency of the Insurance Acts to provide every worker with medical attendance on the lines of private practice may be interfered with.

Now, as regards the midwives, about 50 per cent. of the total number of pregnant women and 75 per cent. of working women engage midwives to attend them, and perhaps this scheme will affect the midwives more than the doctors. The chief cause of the opposition of the midwives to this scheme is due to the proposal to take their supervision out of the hands of the Councils and County Boroughs and transfer them to the Borough Councils. The midwives seem very certain that it would be a move in a backward direction to take away the supervision of themselves from those authorities. Such a transference of supervision has been tried, but was so unsatisfactory that the Counties who had delayed their powers had to revoke their delegation. A striking instance of this was Kent, where the administration of the Midwives Act was delegated to sixty-five different District Councils. Little or nothing was done to carry out the Act, and the difficulty in obtaining any trustworthy returns from the various authorities was overwhelming. Moreover, a Departmental Committee which met to consider the working of the Midwives Act, passed a resolution that "it is the emphatic opinion of the Committee that this power (of delegation) should be withdrawn, and that in cases where it is still exercised it should be revoked."

It is a great advantage for a midwife to be responsible to one inspector only, whereas under the proposed scheme, a midwife working in London, for instance, might be responsible to the inspectors of as many as five or six Borough Councils.

It is contended that the health visitor of a District Council could not devote the whole of her time to inspecting midwives, and the duties and payments of such a post would not be likely to attract to the service such women as are now commanded—women who combine high technical qualifications with wide general experience of midwifery, and who at present inspire confidence and respect among every class of midwife.

Midwives are to be encouraged to accompany their clients to a centre or to send a note to the doctor concerning them. But who is to pay the midwives for this extra work which they would be called upon to do? There is no mention in the scheme of this aspect of the case.

The work at the Maternity Centre will be, primarily, one of examination, but supposing a pregnant woman is examined by her doctor as she should be, will she not be very likely to resent a further detailed and somewhat prolonged examination? Now, let us examine a scheme that is proposed in place of that advocated by the Local Government Board.

The Representative Meeting of the British Medical Association in May last passed the two following resolutions:—

(A) That in the public interest the employment of private practitioners would be the best system for adoption.

(B) That such a system would be beneficial and attractive to the medical profession itself, and therefore its adoption would not only be the best in the public interest, but would also be the line of least resistance.

And the scheme it proposed is as follows :—

(1) General supervision, including responsibility for records and statistics and the following up of cases to ensure that adequate treatment is obtained, to be undertaken by a supervising authority, preferably the medical officer of health assisted by nurses or health visitors.

(2) Attendance at a centre or at such places as may be arranged for the purpose of giving advice and deciding if treatment is necessary, and the treatment at this centre of such selected classes of cases as may be determined upon by the local authority. This work to be undertaken by all those local practitioners who are prepared to do it. Such practitioners would be required to attend at the centre or arranged place for a specified time on certain days at fixed intervals.

(3) Treatment of all cases requiring ordinary medical attendance, to be undertaken either at the centre, at the doctor's surgery, at the patient's house or at an institution.

(4) All persons referred to the centre to be allowed to choose whichever doctor on the list they prefer to consult.

The work of this rota of doctors would consist in the examination and advice to expectant mothers, and the keeping of such records and the giving of such treatment as is included within the scope of the scheme. The midwives also suggest that the practising midwife should be included in either scheme by enlisting her sympathies and securing her services. It is pointed out by those who speak on their behalf that the practising midwives would get in touch with the pregnant woman earlier than any official, especially as there is certain to be great resistance among the people to notify pregnancy to any public authority. The midwife is often the only confidant of the single pregnant woman, and such knowledge is of very great importance in regard to the question of abortion.

Midwives are now trained to recognize conditions requiring medical advice, and by the rules of the Central Midwives Board are bound, when they discover that the patient is in need of such advice, to refer her to a doctor.

The midwives could quite well work in with the scheme proposed by the British Medical Association: It is more than probable that if suitable arrangements could be made with the doctors we should get a more educated class of women practising as midwives. At present, a large number of the women who have passed the examination of the Central Midwives Board, and who would be most suitable for midwives, do not practise as such. Now, it is impossible to do without midwives, the statistics I have already quoted prove this, and yet the majority of practising midwives are not of the class one would wish. Neither the Local Government Board nor anyone else will ever get proper ante-natal care of the poorer pregnant women until the midwife is made to feel her full responsibility. Educate the midwife well, make her position a decent one, and with her help, under the guidance and direction of the general medical practitioners, such a scheme as that outlined by the British Medical Association could be made the greatest success.

It is quite certain that the Local Government Board has in mind the desirability also of the local authorities starting a "Notification of Pregnancy Scheme," since it is evident that the elaborate machinery set up for a Maternity Centre would lose a vast amount of its utility unless such a scheme was started, and in fact the memorandum states that one of the chief objects of the Centre is to secure the medical supervision of the expectant mother, which of course could not be done unless the mother notified that she was expecting, or someone did it for her.

Both the general medical practitioners and midwives have no doubt that it would be all for the good of the expectant mother and the nation if ante-natal care and treatment were more seriously considered than up to the present has been possible, but to do so by a notification of pregnancy would only appeal to these bodies if this was really voluntary. The main objection is that some of the local authorities who have adopted a so-called voluntary system appear to have tried their best to make it look as much like a compulsory system as possible.

There are many practitioners in favour of the voluntary notification of pregnancy and there are some against it, but I think I may say that at the present time the vast majority of practitioners in the United Kingdom are dead against "compulsory notification." Now, although the Local Government Board is at pains to indicate that it does not approve of compulsion, and distinctly states that such notifications should not be made unless the express consent of the expected mother has been previously obtained, a large number of doctors, with the recollection of what has happened before under somewhat similar circumstances, can only see the thin edge of the wedge in this insistence of the advantages of voluntary notification. Their fears in this respect are not, therefore, allayed by the action of the authorities of the City of Nottingham, which is issuing to the midwives in its districts formidable-looking documents surmounted by the Arms of the City, asking the midwives to notify upon these documents the names of their pregnant patients, and also the answers to a number of questions of a very personal and private nature concerning them. Which documents, be it noted, have apparently been regarded by some midwives as a demand and which can be returned through the post, unsealed, for the cost of a halfpenny. Again, the Huddersfield authorities, by offering half-a-crown to the doctor or midwife for each patient that is notified, do not intend to let the grass grow under their feet.

Expectant mothers used to make the necessary arrangements for their confinement much earlier in pregnancy, but now, since the advent of the Maternity Benefit, because they know this money is coming in, the present tendency is for them to put off engaging their attendant till on the average about two months before the confinement.

It is contended that the notification of pregnancy, if compulsory, will postpone the necessary arrangement being made for the confinement to an even later date, when the great object of this scheme is to induce them to notify as early in pregnancy as possible.

Then the patient herself is concerned in this notification of pregnancy in more ways than one, and personally will have a good deal to say to it. Many women will consider the visits of the health visitor, resulting on notification, as an intrusion, and will, on that account alone, delay engaging a doctor or midwife till the last moment. Until notification becomes compulsory, single women will certainly postpone engaging an attendant till the last possible moment, and in many cases these are the very women one would wish to get hold of. And besides that, working women nowadays are not going to stand class legislation, and they will see to it that the same regulations apply to the pregnant duchess as to one of themselves.

The Local Government Board has professed a platonic respect for the proposal that the general practitioner, wherever possible, should be employed in the ante-natal schemes, but past experience inclines the practitioner to believe that the Board will practically give its weight to the whole-time scheme. Town Councils like to have the full control which they can exercise over a whole-timer, whilst by such schemes the status of their medical officers of health is enhanced, with the result that the employment of general practitioners never gets a fair chance.

Members of the civil community, when they or the members of their family fall ill, have to employ the general practitioner. If the Local Authorities gradually take out of his hands all the work which really belongs to him, he will become a mere guide to the nearest specialist or institution, and his status and capacity will be gradually undermined.

In the London school clinics such a method as that proposed by the British Medical Association has been a great success, but no local authority has yet given this method a trial with respect to ante-natal clinics. The Local Government Board's help probably means that it will stand by and will not actively interfere.

The Board thinks that a rota of doctors is the least satisfactory method of dealing with the subject, but the British Medical Association's proposal does not imply a rota in the strict sense of the word. The word " rota " has a sinister meaning, giving the impression that patients seen at one visit by one doctor may very well be seen at the next by another. The British Medical Association's plan means nothing of the sort. It aims at these men serving for stated periods, which shall be long enough to enable them to become expert at the work. They must attend regularly once or twice a week at a stated place, and the patient on her return visit will be seen by the same doctor. Such a scheme would have the great advantage that, within a certain time all the younger men in a locality would have passed through the maternity clinics, to the great benefit of the community and the greatest benefit to themselves.

It is not true to say that general medical practitioners are hostile to the proposed scheme of the Local Government Board: refer to the resolution of the Council of the British Medical Association, and later endorsed by the representative meeting, which I have previously quoted. If the officials will consult the local profession, as surely they should do if they are anxious to make it a success, they will find them entirely sympathetic. The idea that the profession is hostile comes from a body of whole-time officials, whose ideal is a discipline of the race and its proper subordination to a class of super-officials. The profession, however, is hostile to any attempt to apportion work to whole-time officials which it believes can be done as well or even better by the general practitioner.

One cannot have a specialist at every woman's door, but Heaven help her! if the doctor who *must* attend her in her emergency or for her so-called trivial complaints, has had all the backbone and interest in his work taken out of him by having the really interesting medical work handed over to a hierarchy of official specialists.

Against such a scheme as is outlined by the British Medical Association it is suggested that the practitioner presiding at the Centre may be seeing and advising the patient of another doctor; but if the woman's doctor is on the staff of the Centre she would presumably go to him, whilst if every man had his chance of being on the staff the risk would be the same for all.

Then as to the guarantee of the competency of the members of the medical staff. There are his qualifications, and it must not be forgotten that many so-called specialists in tuberculosis, for instance, are youths and maidens, with a high qualification if you like, but with an experience that, in many cases, extends to only a few months in the subject in which they are posing as specialists.

Is not the qualified doctor with some years' experience of midwifery and doctoring infants *prima facie* as likely to be as competent as the kind of young woman who would probably be appointed to most of the new posts. If more practitioners apply than are required, the Local Government Board must make a choice, just as it does in the London school clinics.

The highly specialized members of the profession are not doing their duty to their profession, or to the community, unless they interest as large a number of general practitioners as possible in such a scheme as that suggested by the British Medical Association.

General practitioners, like medical officers of health and consultants, are good, bad, and indifferent; but it behoves those of us who have the interests of the nation at heart, to try to improve their position and insist on their taking a part in these communal schemes, not only because they are members of our profession, but because the community cannot dispense with that experience or that knowledge of human nature which they acquire by virtue of their daily work.

The Importance of linking up all Organizations for Maternity and Child Welfare in Local Health Districts.

By Lady Barrett, M.D.

In all organization to secure a normal motherhood and infancy we have to remember that the central factor is the mother, and mothers are self-respecting human beings, thoroughly British in resenting interference as to the best way of managing their own affairs, and particularly sensitive in regard to the subjects with which we are concerned, their homes and their children. I suggest, therefore, that the linking up of organizations for maternal and child welfare must be planned with the mother, her wishes, her prejudices, and her disabilities in the focus of our attention, for, without her co-operation, our schemes, however excellent, are foredoomed to failure. It is true that the mother does not yet know what she needs. So accustomed is she to a maximum of suffering and a minimum of comfort that she does not dream it possible that even the luxury of having time to be ill could ever come her way.

Let us therefore consider for her what her need is. I propose to discuss very briefly: (*a*) The need of the mother—medical, educational, and social; and (*b*) existing organizations, in order to clear the way for some suggestions in regard to (*c*) co-ordination.

(*a*) (1) The *medical need* is threefold. It must include medical supervision during pregnancy, skilled attention at labour, and medical supervision during lactation. We ought to bring within the reach of every mother in the land skilled obstetric assistance at labour, that is, such skill and knowledge as can only be acquired by special study. It is obviously impossible that every mother can be attended by an obstetric specialist, but an obstetric specialist should be available when necessary for every woman in time for the best results to be obtained. To secure this in town or country, arrangements must be made whereby every midwife has a doctor provided for each case should it prove to be beyond her powers, and every doctor has a specialist to call in for cases of difficulty. The possible weak links in this chain would be if the midwife did not recognize early signs of abnormal labour, or if the general practitioner failed to realize that operative procedure beyond his experience or resource were necessary in the best interests of mother and child. Modern teaching of midwives and medical students should, however, minimize or eliminate these risks. But the medical responsibility with regard to maternal and infant welfare does not begin or end with suitable conduct of labour. Medical supervision throughout pregnancy, and I suggest throughout lactation, are necessary if the ideal of prevention of ill-health is to be secured rather than the cure of ailments when they arise. It is better to provide a fence at the top of a cliff than an ambulance at the bottom. I hope the term "ante-natal clinic" now growing up through the demand for supervision during pregnancy will be replaced by some such term as "maternity clinic," which shall include in its work post-natal as well as ante-natal care. This, of course, involves a considerable amount of medical work which has not hitherto been given, and I fear we must recognize that supervision by visits to the houses of the women would be quite impossible with the present supply of doctors even after the War. The suggestion of maternity centres, where pregnant and nursing women would attend to see the doctor periodically, materially lessens the work while securing continual touch between doctor and mother.

(2) *Educational Need.* — Most mothers need education in all the activities which pertain to the making of a home and the bringing up of children, for, while it is quite true that all the education in the world will not teach a woman to mother, yet a mother's love for her children without knowledge has in the past led to many harmful practices, and I suppose we all recognize that better education does not destroy any useful quality of mind or heart. Education in things pertaining to health should be, if possible, first suggested to the mother by a doctor, but must be taught over and over again in the home by someone who is regarded as a friend, yet is qualified for such work, if good results are to be obtained. Education in many household affairs is best taught at first outside the home in maternity centres where practical and not theoretical methods are employed, and where the stimulus of competition in learning and other elements of club life make education a pleasure.

(3) *Social.* — But medical skill and educational advantages alone would still leave much to be desired. Suitable houses in which to rear children, as well as suitable environment for parturition, are necessary if mortality and morbidity of mother and child are to reach the lowest possible level. I suppose that we all agree that the homes in which much of our hospital out-patient maternity work is carried on are wholly unsuitable. The technique of midwifery is the technique of surgery, and no surgeon would dream of doing surgical work under conditions passed as good enough for midwifery. We need hospital conditions for all cases in which surgical interference is required, and for all patients living in insanitary dwellings or who cannot provide one well-ventilated room for the mother's use alone during the lying-in. This is surely the minimum demand. In the case of mothers who are confined in their own homes two further needs arise, closely associated with efficient medical aid—viz., nursing for the mother, and cooking and housework for herself and family. Work which has employed the mother's whole time cannot suddenly cease, and we find that mothers wish to be confined in their own homes rather than in the comfort of hospital in order that they may do the work of the house as best they can during the lying-in. Some provision for her housework to be carried on is as necessary as nursing for herself. But the homes are not only unsuitable for midwifery; many involve work for pregnant women more injurious than paid outdoor work which calls forth such condemnation. I refer particularly to the inefficient arrangements for water, coal, food, &c.,

involving much carrying of heavy weights upstairs and difficulty in obtaining any ordinary standard of cleanliness for house and children. The sanitary arrangements of many dwelling-places of the poor are so bad that it is almost incredible that they have been tolerated in homes which rear the citizens of the richest empire in the world.

(*b*) The existing organizations are: medical, municipal, and voluntary.

Medical.—Provision for midwifery in any urban district includes the work of midwives, medical practitioners, hospitals, and Poor Law infirmaries.

Municipal work for the care of mother and child is carried on by the Medical Officer of Health and Public Health Committee, with the aid of the sanitary inspectors and health visitors. In some districts municipal payment in part is made to midwives and doctors, and municipal maternity and infant welfare centres are provided, including in some cases dining-rooms for expectant and nursing mothers.

Voluntary philanthropic agencies are numerous. It is only just to remember that the interest aroused in the whole subject is largely due to the work and influence of these agencies. The more important are schools for mothers and infant welfare centres with various activities, including infant consultations, health visiting, classes, crèches, dinners for nursing and expectant mothers, and more recently—ante-natal clinics and dental clinics. Other useful societies provide day nurseries, invalid cookery and home helps. Such are the various organizations more or less in touch with each other which are at present attempting to supply the needs of maternity and infant welfare. Clearly a closer co-ordination as well as extension of these agencies is necessary.

(*c*) *Co-ordination.*—The memorandum of the Local Government Board has given a centre around which these various agencies may crystallize. We are introduced by it to the idea of a "maternity centre" and its possible activities, which may include: Medical supervision of pregnant and nursing mothers, attendance at confinement, pathological investigations, medical supervision of infants, medical supervision of children aged from 1 to 5, health visiting, educational facilities, and dinners for pregnant and nursing women. Such activities involve at least two types of institution—the hospital, and the infant welfare centre—together with visits in the homes by health visitors, and midwifery attendance whether by doctor or midwife.

In venturing to open a discussion on the question of co-ordination, three principles seem to be of paramount importance.

(1) That all sanitation, health visiting, statistical work, &c., must

centre in the Medical Officer of Health of the District and Public Health Committee.

(2) That all medical work of the district, medical, surgical and pathological, should centre in the hospital.

(3) That all voluntary work, which is necessarily supplementary, should be organized in relation to the activities of these two main centres and should supply the social and educational part of the whole.

With regard to the first point the reasons are fairly obvious:—

(*a*) Only an organization controlled by the State and municipality can cover the whole ground; voluntary work, and what I may call voluntary municipal work, is always patchy in character. Only control by a State department can make municipal work approach uniformity of standard, and only municipal control can bring the health of a whole district to the highest level. We hope that such a State department may one day be set up under a Minister of Public Health, and deal exclusively with all that pertains to the health of the nation.

(*b*) Only a national organization can supply adequate funds for this work.

(*c*) The annoyance of a multiplicity of visits and other overlapping can only be avoided by central control.

The advantages of the second point—namely, that the hospital should be the centre of the maternity work of the district are many:—

(i) In such a scheme as that suggested by the Local Government Board it must necessarily be a hospital which provides beds for observation of diseases of pregnancy, for difficult labour, for normal labours where social conditions render the home unsuitable, and for cases of sepsis or other puerperal complications which may arise in the midwifery practice in the district.

(ii) The hospital should therefore naturally provide for the pathological work, not only of the cases within the walls, but also for all cases in the district which it serves.

(iii) If cases requiring in-patient treatment and pathological investigations are to flow towards the hospital as a centre, its activities should also include: Out-patient consultative maternity clinics, out-patient consultative infant clinics, out-patient consultative children's clinics. Cases would be referred to these clinics for advice by doctors, by midwives, or by the smaller type of maternity centre.

(iv) Research work in obstetrics done at a hospital in such intimate and friendly relations with the whole maternity work of its district will command at once material necessary for such research.

(v) Where a teaching school is attached, the advantage of such concentration of work is obvious, and I venture to suggest that in the future it may be desirable to abolish the teaching of midwifery in the external districts of our hospitals and so disarm any feeling there may be in the minds of doctors and midwives that the hospital competes unfairly with them in their own field.

If such a concession should lead to all complications finding their way to the hospital and all normal cases unable to provide for themselves—the teaching of practical midwifery would have nothing to lose and much to gain.

If the maternity hospital of any district fulfils all these functions, Poor Law infirmary midwifery would cease to exist, and I venture to suggest that this would be entirely beneficial to mother and child, providing as well many additional normal cases for study in the lying-in hospital wards which might otherwise tend to have too large a proportion of cases of difficult labour.

Such a hospital constitutes one type of maternity centre—the consultative type; but two types of centre are necessary to fulfil all requirements. If we are to have the facilities of fully equipped hospitals and pathological departments, with the latest appliances for routine work and research, they cannot suitably include such work as classes and demonstrations for the women, with nurseries for the children while their mothers are taught, or dining rooms for necessitous cases, &c., and it would be unnecessary to multiply such institutions so as to be near the homes of all concerned.

But facilities on behalf of mother and child, to be attractive to the mother, must be within reach of her home and must not involve long hours of waiting.

Small centres are needed in sufficient numbers to serve all working class areas within easy reach of the mothers. Just as there are gradations in obstetric aid so there may be two kinds of obstetric clinics, and all such small centres therefore should include maternal consultations, ante-partum and post-partum, and infant consultations, and children's and dental clinics.

The majority of cases supervised at the smaller clinic would need no further medical care, but more serious cases would be at once referred to the consultative centre serving that district, either directly or through a medical practitioner. Two points seem to be of special importance in regard to maternity clinics in these welfare centres:—

(1) They enable every midwife's patient to have medical supervision during pregnancy, a great advantage to midwives.

(2) They make it possible for every case of pregnancy illness to be referred to the doctor who will be present at labour.

The smaller centre would include under the same roof all other activities unsuitable for a hospital, which are now carried on by schools for mothers and which constitute the centre a sort of maternity club as well as a medical agency. All this work might continue to be done by voluntary help even if the centres become municipal in finance and control. This type of minor maternity centre, with its clinics, bristles with debatable points and difficulties, the most important of which is their relation to the medical officer of health and to the midwives and doctors practising in the district. The agent of the medical officer of health in the homes of the women and at the centre is the health visitor, or sanitary inspector, or both, and if all sanitation, health visiting, &c., is to centre, as it must do, in the medical officer of health, the qualifications and duties of this officer, call her what you will, are of great importance.

One of the many trials of the working-class mother must be the desire of so many people to do her good, and their determination to invade her home for that purpose. Organization of maternity help might safeguard mothers from such indiscriminate visiting and yet secure that every home shall have one visitor with the necessary knowledge to observe sanitary and structural defects and to teach the mother about simple laws of hygiene and infant care, and who has also sufficient tact and sympathy to win the mother's confidence and interest, and attract her to share in the activities of the centre. Such a visitor needs special training, which should include practical and theoretical work in sanitation, tuberculosis, health visiting, infant care and the nursing of children, and also some knowledge of midwifery and of sociology.

A health visitor with these qualifications, working under the medical officers of health, would bring to the notice of the authorities the need for reforms in the housing and sanitary arrangements of her district; she would put out-of-work husbands in touch with the labour exchanges and other agencies, she would report cases of suspected tuberculosis, &c., and women pregnant would be invited to the maternity centre where they would at once be in touch with medical and social care. There would be no need for any other official or visitor to enter the home save the midwife or doctor engaged for the confinement.

At the present time the lack of sufficient municipal health visitors is supplemented by the work of women paid by voluntary Infant Welfare Centres whose qualifications vary. It is most desirable that even if for a while voluntary societies have to supply some of these workers, that a uniform qualification should be established and that the societies should instruct their visitors to report to their medical officer of health and to receive instructions from him. Just as the Health Visitor would send women to the Infant Welfare Centre, so in turn would the centre send cases to the doctors and midwives. To this end it would be necessary to keep a register of all practitioners and midwives willing to do midwifery in the areas concerned, with the fees for which they would work recorded at the centre, and in the case of the doctors the fee also for which they would be willing to attend a case in which the midwife was in difficulty. Every mother could then choose whether she would be attended by midwife or doctor. She would have free choice of both, knowing the fee she would have to pay.

In the case of the women choosing midwives it will be essential for more skilled advice to be at hand should the case prove to be in any way abnormal, and it is suggested that the mother should herself choose in such cases one of the doctors on the list, provided his fee be known. The maternity centre would be furnished with complete information, and the mother would be directed to go to the address of midwife or doctor as the case may be, to be seen as early as possible in pregnancy.

In most poor quarters the patient will be unable to pay the fee of a doctor called in for difficulty, in addition to the already arranged midwife's fee. Yet it is essential that such help should be available because midwives are not only unable but are forbidden to deal with such cases. This difficulty has been met by the Local Government Board if the Local Health Committee is willing to be responsible for half the expense.

It is equally desirable that the doctor should be able to send for hospital aid should the case be beyond his resource. The hospital might thus in three ways become the free Consultative Centre for the district with advantage to both hospital and doctors.

(1) Every practitioner in the district would be invited to send cases of illness in pregnancy or after the lying-in period to hospital for consultation or an opinion, which should be written to him (if unable to meet in consultation), together with any necessary pathological report.

(2) Any practitioner in difficulty during labour might send to the maternity department of the hospital for assistance, or for admission to the beds of the hospital.

(3) Any practitioner might send material for examination, or patients for the Wassermann or other reactions, to the Obstetric Pathology Department, a report of which should be given; the cost of such outside work would naturally be paid by the Public Health Authorities.

With regard to the question whether general practitioners or whole-time officers are to do the work at the small centres it may be pointed out that it would not tend to win the confidence of the women if a succession of different doctors attended the clinic, nor would it tend to efficient work. If the general practitioners practising midwifery in the district would elect one of their number to do this work this grave difficulty would be avoided, but I fancy in most districts it might be thought that this would give the chosen medical officer an unfair advantage over his fellow practitioners. If so the difficulty would probably best be solved by the appointment of a whole time medical officer.

In closing this inadequate survey I venture to submit that some such method of co-ordination of work, starting with the routine visiting of every home by a competent visitor and securing the medical supervision of all pregnant, parturient and puerperal women, would obviate the necessity for anything so repugnant to the feelings of the mother as the compulsory notification of pregnancy, yet would secure the same end.

Professor L. A. KRIVSKY, M.D. (Petrograd).

A fortunate occurrence enables me to give to you some information as to the manner in which the question under discussion is dealt with in Russia. I have recently received the Russian *Journal of Obstetrics and Diseases of Women*, and I discovered in it a paper by Professor A. A. Redlich, entitled "The War and the Care of Maternity and Child Welfare." This was an address delivered by him on March 6, 1916, at the Congress of the Pan-Russian Institution for the Care of Maternity and Child Welfare, under the august patronage of Her Imperial Majesty Alexandra Empress of Russia. As I think that the views expressed in this address will be interesting to English physicians, because they will give some idea of the state of this question in Russia, I intend to give a short extract from this paper of Professor Redlich.

The birth-rate in the fifty central provinces of European Russia is decreasing: between the years 1894-96 it was 49·9, but between 1909-11 it decreased to 44·8 per 1,000 of the population.

The death-rate is also decreasing, but very slowly: from 36·3 between 1892-95 to 29·2 between 1908-11.

In the year 1913 in the same provinces of Russia there were 5,249,677 births and 3,338,938 deaths, which makes 43·1 per 1,000 births, 27·4 deaths, and 15·7 natural increase of population. The general death-rate in Russia is very high and due to the enormous mortality among children up to one year; the latter is 27·2 per cent., while the minimal mortality is between 7·1 and 6·7 (Sweden and Norway) for each hundred children born.

According to the figures of the lying-in hospitals, the number of still-born children must be estimated at 5 per cent., and the number of miscarriages at 10 per cent. Therefore, from the 5,249,677 births in the year 1913 in the provinces mentioned there were 870,000 miscarriages and stillborn children.

As one of the most important causes of mortality amongst children up to 1 year appears to be the absence of mother's milk, or, at least, of rational artificial feeding, the public generosity in Russia displayed itself in the founding of two societies—(1) "The Society for the Prevention of Mortality amongst Children," and (2) "The Drop of Milk," organized in a manner similar to the French societies (Goutte du Lait).

A little later the Russian Government assisted the cause by the passing of a Maternity and Sick Fund Bill on June 23, 1912, which enables women to claim a weekly sum of money equalling from the half to the whole of their usual wages during a period of two weeks before confinement and four weeks after it, provided they have been working no less a period than three months. Unfortunately, however, this Bill only applies to the women working in factories employing no less than twenty hands, and worked by mechanical motors. According to the provision of the Act, the employee subscribes a certain percentage into the fund, the employer paying the rest. Up to January 1, 1914, there had been opened in Russia 773 sick funds with 561,803 members.

The much too small amount received by the member before and after confinement points, in my opinion, to the necessity of financial help from the Government, as is the case in England and Norway. At last, on May 31, 1913, there was founded by the edict of the Emperor the Pan-Russian Institution for the Care of Maternity and Child Welfare, under the august patronage of Her Imperial Majesty Alexandra Empress of Russia, and a special body, the aim of which is to unite all the different efforts working in the direction of the prevention of infant mortality and the care of maternity and child welfare.

Besides this, a Special Commission for the Revision of Medical and Sanitary Legislation perfected a programme for the extension of the lying-in hospitals necessary for securing to the population contemporary obstetrical assistance. To accomplish this end the Russian Empire needs 37,000 beds and 60,000 midwives, which would guarantee hospital accommodation in 50 per cent. of the cases of confinement.

The real number of midwives at present in Russia, is 14,361, and the number of confinements which could be assisted by them is about 700,000. In the year 1912, out of 7,033,507 children born alive, only 25,240 were born in the lying-in hospitals; if we added to this number the stillborn children and the miscarriages, then 95 per cent. of the confinements occur without any obstetrical help whatever. Up to the present, the care of the health of the people has been chiefly in the hands of the municipal authorities of the towns and Zemstwos. These latter gradually improving, the medical assistance reached in some provinces the ideal, which was the object of the Commission mentioned.

Quite recently (September, 1916) there was instituted in Russia the chief Board of National Health, which is upon the same footing as a Ministry.

We can hope that it will also assist in the development of legislation and medical help in cases of maternity and in the diminution of morbidity and mortality among lying-in women and the mortality among the children.

Professor MUNRO KERR, M.D.

All of us interested in obstetrics and gynæcology must feel grateful to those who initiated this discussion, and particularly to these speakers who have so ably opened it. It may seem hypercritical, but to my mind a more suitable word might have been substituted for "need." The need is now admitted by every one. Every one admits that hundreds of lives, both fœtal and maternal, might be saved if pregnant women were better cared for—deaths from septicæmia, the toxæmias of pregnancy, forceps delivery, craniotomy, and from many other complications of pregnancy and parturition, could in great part be avoided. I do not say they could be absolutely abolished, but I am perfectly certain that 90 per cent. of the deaths that occur from these complications should not occur if pregnant and parturient women were looked after as they should be looked after, and as they will ultimately be looked after as preventive obstetric medicine advances, and social conditions are attended to and improved. What we really want to recognize then, is not the need for improvement, but the means to be employed for securing an improvement in the care of pregnant women.

There are two bodies of people concerned in this problem: (*a*) *Those who require to be cared for; (b) those whose duty is to help those who require care; and until each of these groups of people work together willingly and harmoniously ideal conditions will not be reached.*

In the remarks I have to make I desire to consider the subject under these two heads mentioned.

(*a*) *Those who require to be cared for.*—All pregnant women require to be cared for, but you will admit, I think, that as one passes down the social scale the amount of care pregnant women receive steadily declines. At the one extreme are the people in comfortable circumstances who place themselves under specialists or properly skilled and careful general practitioners. At the other extreme you have those who seek no medical advice during pregnancy unless they become extremely ill. The care of the former, those at the top of the social scale, is satisfactory, and improvement can only result as our knowledge of pregnancy and its complications increases. At the other end matters are very different, largely owing to ignorance and the casual-drifting, hand-to-mouth, existence of these individuals, upon whom many of the diseases of pregnancy slowly and insidiously steal until they are brought to hospital dying or doomed to death or permanent ill-health.

But between the two I am sorry to say there is a large body of the lower middle-class who, partly from their own fault (ignorance, the desire not to incur expense, &c.), and partly because their medical attendants do not fully appreciate the necessity of giving special attention to the pregnant condition, also drift into a diseased condition, often serious, sometimes even fatal.

I repeat conditions in the first group are satisfactory. We can leave it alone. The lowest group is absolutely unsatisfactory, the middle group is not quite satisfactory; but the middle group can be readily made satisfactory, because it is a body of people amenable to reason and instruction, and attended by a body of medical practitioners who only require to be impressed with the necessity of caring for pregnant women more than they have done in the past. But the lowest class is very different. Appeal to them is futile; considerate but firm legislation is the only way in which you can secure an appreciable improvement in the present state of matters, which all of us are agreed is deplorable, and which we are determined shall not be allowed to continue.

You naturally ask: What legislation do you propose? My proposal is that an intimation of pregnancy should be made compulsory. Some years ago, at the International Congress on Infantile Mortality held in London, at which I was asked to read an address, I brought forward this view; it received no support, neither did it receive any support when the subject of Infantile Mortality was considered at the International Medical Congress in London in 1913. But I am more convinced every day that some such legislation is necessary if we are really to make appreciable progress. The women who elect to be attended by medical practitioners should intimate their condition to these practitioners at an early date. After the confinements are over the practitioners should send in their returns with the dates when the pregnancy was intimated to them and they confirmed the pregnancy. With the poorer classes, attended by midwives, the intimation should be made to the authorities, Public Health Authorities, or others who are now to be made responsible for the care of pregnant women, and the penalty for not making intimation at a reasonably early date might be that deduction from the maternity benefit would be made.

I should like very much to go into further details regarding this proposal, but time will not permit. This only would I say: that

I cannot see that any hardship would result from such a scheme, or that the sensitive and delicate feelings of prospective mothers would in any way whatever be outraged if the scheme were properly considered and arranged.

(*b*) *Those whose Duty it is to help those who require Care.*—There are three bodies of people who can help: (1) Obstetric and general practitioners engaged in midwifery practice; (2) Public authorities; (3) Private individuals interested in infantile mortality and the care of pregnant women.

Obstetricians can do an enormous amount. After all they are the expert advisers by instructing medical students, midwives and nurses, by establishing clinics in connexion with maternity hospitals. In many other ways, they can, and most of them are already doing invaluable work. Many practitioners in general practice, are helping also, but they could do more, they could encourage still further pregnant women to consult them, and they could employ the specialist more frequently by sending these poorer patients earlier to hospital.

Public Health Authorities.—It is for these to see that the pregnant women are cared for—they are responsible for the establishment of antenatal clinics in large towns or the proper supervision by local practitioners in smaller towns, villages and country districts, for the supply of skilled midwives and many other matters I have not time to mention. By the Notification of Births Extension Act, 1915, the responsibility not only for the care of infants, but for the care of prospective mothers, nursing mothers, infants and children up to 5 years is handed over to the Public Health Authorities.

Take my own city, the City of Glasgow: the Public Health Authorities propose to have an ante-natal clinic at the Maternity Hospital, and at such of the infant consultations and tuberculosis dispensaries as may be necessary. There is also a proposal, and there is every chance that it will materialize, to open wards for the indoor treatment of ante-natal conditions, the Corporation to contribute £1,000 per annum to its maintenance. Thus in Glasgow the obstetricians and the Public Health Authorities are mutually assisting each other and co-operating to establish a more satisfactory state of matters. Midwives will also have to be supplied by the Public Health Authorities, and probably some mutual agreement between the bodies mentioned will readily be established. In any case the more difficult and complicated cases will be drafted into the Glasgow Maternity Hospital; somewhat similar arrangements will be made regarding the post-natal department.

In the Maternity Hospital we have recently appointed an almoner and are erecting a clinical laboratory.

Private organization and individuals interested in infantile and maternal welfare have been given an enormous field upon which to expend their energy in the crèches, day nurseries, playgrounds, kindergartens, school of instruction for students, mothers and infants. The large hospitals supported by voluntary subscriptions will, I believe, soon be a thing of the past—it will be impossible to keep them going on voluntary subscriptions, but there are hundreds of schemes for bettering the domestic conditions of the people, which, for many years, must be supported by voluntary efforts and the generous public.

Professor HENRY BRIGGS, F.R.C.S. (Liverpool).

I cordially approve of the manner in which the discussion has been introduced and opened. I came to the meeting chiefly to hear the views of others; my own remarks will be brief. For the widest possible practical application of a maternity and ante-natal scheme, co-operation is essential; co-operation amongst the many individuals and the many public bodies, voluntary and legal, moves ahead slowly. We have just heard what has been so well done in Glasgow. At the Central Midwives Board meetings I have been long familiar with the efficiency of administration in London, Manchester, and other popular centres. Dr. Hope, of Liverpool, suggested to me that I should ask that the example of Liverpool should be followed; in my own city co-operation underlies the welfare of the patient, the midwife and every one concerned. Amidst a steady general advance there has been trumpeting on the part of those who are afraid or already have caught the ante-natal fever more or less badly. Extension and widening of maternity and ante-natal welfare are certainties, and whether ultimately there is to be an "intimation" or "notification" of pregnancy, its adoption is to be expected when the moment is favourable. It was Mathews Duncan who said that the most difficult acquirement in midwifery practice was patience.

Miss ROSALIND PAGET.

We midwives quite realize that there is much room for improvement in regard to ante-natal care, and that we, like others, have not in time past paid enough attention to this branch of our work as we should have done; we have now for a considerable time been doing our best to remedy this defect. From our standpoint may we urge that improvement greatly depends on the following points being attended to:—

Early booking.

The provision of up-to-date instruction for midwives in regard to ante-natal questions.

The provision of facilities for adequate medical treatment when required for midwives' cases.

Encouraging the right class of woman to take up midwifery by improving her status, recognizing her responsibilities, and making it possible for her to earn a decent living.

Early Booking.—This is difficult to attain. The maternity benefit has considerably interfered with it. Any form of notification of pregnancy would prevent it, especially amongst the independent self-respecting women who form a large part of the patients in many midwives' practice, and who are the backbone of the nation. Many midwives' cases do book early, but great tact is required in regard to all investigations.

We midwives feel that our position as the chosen servant and friend of our patients gives us a unique opportunity for usefulness in regard to discovering early some of the causes of abortion, stillbirths, and premature labours (some, let us hope, preventable if taken in time). We get early cognizance of drug-taking, of the existence of constitutional disease, of the alcoholic habit, and of many other unhygienic conditions, and we are able to persuade our patients to obtain medical treatment, and here comes in the need for facilities for obtaining adequate medical treatment. If you will provide this for us, we will see that our patients make full use of it, and we will endeavour to enforce your orders.

We ask you not to ignore and waste the work of the midwife, but to include her in any scheme, because she attends 50 per cent. of all births and about 75 per cent. of working-class births, and this is increasing owing to war conditions. If she is competent to undertake the conduct of labour she is surely able to give ante-natal care, and recognize when medical advice and treatment is required.

It is said that some midwives are not competent: this is sadly true, but the number is rapidly decreasing owing greatly to the admirable teaching of the inspectors, who are the midwives' truest friends. If midwives are not competent there is very efficient machinery to remove them from *their* register, and it should be used.

From every point of view it is advisable to recognize the work of the midwife and make use of her in any scheme. She is a necessity: she is in possession of from 50 to 80 per cent. of the mothers. Nothing is suggested to take her place, therefore she should be made as good as possible, and the best women encouraged to practise. Good candidates are decreasing in number every day. The ranks of the practising midwife are being depleted; they find work as health visitors, sanitary inspectors, lecturers—better paid and without the wearing anxiety of midwifery practice; as it also takes several years to make a good midwife this is a poor look out.

From the economical point of view also it is extravagant not to use material ready trained and on the spot. Since the future of the Empire depends entirely on the coming generation, to exterminate the good midwife would be a national calamity.

Sir FRANCIS CHAMPNEYS, Bt., M.D.

I came this evening to hear what was to be said on the subject of ante-natal care, and I have heard much to interest me. Dr. Moore referred to the question of comparative puerperal mortality in the hands of doctors and midwives. Some years ago the Central Midwives Board tried to persuade the Registrar-General to add to the certificate of birth the name of the person who actually delivered the patient, but were unsuccessful. This addition would have been very useful in many ways. Dr. Moore said that in his experience midwives usually called in the doctor too late. If this is the case, why has not the local supervising authority of Huddersfield referred such midwives to the Central Midwives Board? According to the Rules (E 20) a midwife is bound to advise medical help "as soon as she becomes aware" of the pathological condition, and she is liable to be removed from the Roll for any delay.

Dr. Routh seems to think that ante-natal care is a new discovery. No doubt the great interest recently taken in it is new; but surely Dr. Routh himself, as a careful physician, has looked after his pregnant patients long before the present movement, like other careful practitioners. He also said that by the Rules of the Board (p. 22), the care of the midwife seems to begin with labour. I hold the Rules in my hand, and the only thing which I can find to the point on p. 22 is Rule E 7, which runs as follows: "A midwife in charge of a case of labour must not leave the patient without giving an address by which she can be found without delay." To ask a midwife to leave her address with all her pregnant patients is surely not necessary, even if it were practicable, nor would the words "leave her patient" apply. I think we all agree that the care of pregnant women and unborn children is a work of great importance. In order to render any scheme successful, it is absolutely necessary to enlist the sympathy of all existing workers, especially of doctors and midwives. The doctors should be assured of their fees when they are called in to midwives' cases. For this omission they have largely to thank the direct representatives on the General Medical Council at the time of the consideration of the Midwives Bill, whose one object seems to have been to prevent any legislation. The difficulty was anticipated in Liverpool, where, by the wise forethought of Dr. Hope, an arrangement was made with the general practitioners at the very beginning, and no trouble, I believe, has been experienced.

As regards midwives, they are acknowledged to be a necessity. Doctors are quite unable to attend all the labours in the country, and many must be attended by midwives of some kind. The only choice is between certified midwives and handy women. The operation of the Midwives Act produced a sudden fall in puerperal mortality, which has been maintained since it came into force. If it is still higher than it should be, we must remember that doctors as well as midwives attend midwifery. If there is a shortage of midwives, and handy women return into practice, the puerperal mortality will certainly rise again. Practising midwives are getting steadily fewer. They are a necessity, and are valuable public servants. If all interest is taken from their work, they will become absolutely insufficient in numbers for the work of the country, and disaster will follow. The standard required of them is rising, and the incompetent midwives are being eliminated.

In any scheme the inspectors of midwives are of great importance.

As a body they are admirable; most of them are medical women. Health visitors are a difficulty. It is hard to find enough women with necessary experience and character. Compulsory notification of pregnancy will certainly at the present time defeat its own object. To impose it from above would lead to a reaction on the part of women and of their husbands, which would render it futile, and would certainly tend to diminish the birth-rate. If notification of pregnancy is ever to come in it must be by the wish, and not in spite of the protests of the mothers of England.

Section of Obstetrics and Gynæcology.

President—Dr. G. F. BLACKER.

(*March* 1, 1917.)

A Uterus containing a Carcinoma and a Sarcoma.

By J. P. HEDLEY, M.C.

THE specimen consists of the uterus and both appendages. The uterus is laid open from the front. The cavity of the body is distended by a somewhat pedunculated spheroidal tumour, 6·3 cm. (2½ in.) in chief diameter, which is attached to the posterior wall. Microscopically this exhibits the structure of a spindle-celled sarcoma, without any unusual characters; the free surface for a narrow zone is necrotic. There is no indication that the tumour has arisen by the sarcomatous transformation of a fibromyoma although this is not improbable. In the immediate neighbourhood of this, on its left-hand side, the uterine mucosa is the seat of a somewhat prominent papillary formation which is histologically a columnar-celled carcinoma of the adenoid type—i.e., the cell groups are provided with a glandular lumen bounded by a single series of columnar cells. Neither ovary is obviously enlarged, but both are secondarily diseased, and microscopically present an adenoid carcinomatous infiltration like that of the endometrical neoplasm. The left ovary has been torn in its removal, owing to its having contracted adhesions with the parts around. The Fallopian tubes are of normal diameter and present no indication of being affected either by direct extension or implantation.

I removed the specimen on August 5, 1916. The patient was aged 66, and a virgin. She had always enjoyed good health, and reached the menopause at about the age of 50, without marked disturbance of any kind. Her mother was alive and well. She was sent to me on account of the appearance of vaginal discharge: this started in February, 1916, and was thin and watery but frequently blood stained. Six weeks before I saw her (in July) it had become brown, but had increased considerably in amount. On examination I could find no abdominal tumour, but, by vagina, enlargement of the uterus was obvious. The cervix was healthy.

I regarded the case as one of carcinoma of the body, and advised exploration of the uterus and hysterectomy if necessary. Under the anæsthetic I passed a sound into the uterus, which caused free bleeding, so I decided to go straight on to abdominal hysterectomy without spending time on exploring the uterus further. The operation presented no great difficulties, but fixation of the left ovary by adhesions to the back of the broad ligament and surrounding peritoneum caused some difficulty in separating the uterus on that side.

The subsequent progress was good and uneventful, except for slight solid œdema of the left leg, but there was no rise of temperature, and the patient was able to get up and be out of doors in a chair on September 7. She was apparently quite well when last I heard of her a month ago.

Cases of this nature are of considerable rarity and very few have been recorded in the *Proceedings* of this Section. In 1905 Dr. Spencer brought forward a case and gave short accounts of fifteen cases that he was able to find in the literature. In my case the involvement of the ovaries by carcinoma is interesting. It is possible that the sarcoma originated in a fibromyoma, and the fact of the menopause having been delayed until the age of 50 may be regarded as some slight evidence of the presence of a fibroid at that time.

Professor Shattock, who has kindly examined the specimen and furnished me with a description of it, can find no evidence of the transformation of a fibromyoma.[1]

(*March* 1, 1917.)

Carcino-sarcoma Uteri.

By HERBERT R. SPENCER, M.D.

ELEVEN years ago I showed at a meeting of the Obstetrical Society of London a specimen of "carcino-sarcoma uteri" in which an adeno-carcinoma and a round-cell sarcoma existed side by side in the same uterus, and I gave a short *résumé* of fifteen cases of which I had been able to find the records.[1]

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[1] For report of Pathology Committee *see* p. 134.

To-day I show another specimen in which a carcinoma and a spindle-cell sarcoma co-existed in the uterus; but in this case the typical adeno-carcinoma shows in places a sarcomatous stroma and the typical spindle-cell sarcoma shows carcinomatous changes in the involved glands: to these conditions the names of "carcinoma sarcomatodes" and "sarcoma carcinomatodes" have been given by Virchow, Ehrlich and others. These names are not very appropriate, and for the present it would appear to be better to speak of those cases in which the growths exist side by side simply as "co-existent carcinoma and sarcoma," and to limit the name "carcino-sarcoma" to cases in which the growths are intermingled, as in the specimen now shown. A tendency of the nomenclature to take this direction is seen in the publications of R. Meyer,[2] Forssner,[3] and Shattock.[4]

True "carcino-sarcoma," as thus defined, appears to be very rare; but this apparent rarity may be due to the fact that a sufficient number of sections have not been made to exclude intermingling of the growth. Should further research prove such intermingling to be commoner than is now believed (which I think is not unlikely), the term "carcino-sarcoma" may be used as convenient for indexing cases of co-existent carcinoma and sarcoma, whether the growths are separate or combined.

Briefly, the notes of the case are as follows:—

Mrs. H., aged 56, a nullipara (married four years ago), was seen by me on June 13, 1904. She complained of bleeding and a little offensive discharge for the last three months. Menstruation began at the age of 13, was always regular, occurring every four weeks and lasting seven days. It ceased three years ago. A polypoid growth had been found protruding from the cervix by her doctor, who removed it a fortnight before I saw her. A report by the Clinical Research Association declared it to be a spindle-cell sarcoma.

On examining the patient on June 13, I found the cervix opened to the size of a shilling and occupied by uneven masses which bled on examination. The body of the uterus was movable and apparently not enlarged. There was slight thickening of the cellular tissue to the left of the cervix.

[1] *Obst. Soc. Trans.*, xlvii (for 1905), p. 338.

[2] *Veit's Handbuch der Gyn.*, 1908, iii, p. 500.

[3] *Archiv f. Gyn.*, 1909, lxxxvii, p. 445.

[4] *Proc. Roy. Soc. Med.*, 1917, x (Sect. Path.), p. 48.

On June 18, 1904, the uterus was removed at the patient's house by vaginal hysterectomy with the Pacquelin's cautery. The operation was rendered difficult by adhesions and the growth was much more extensive than had been supposed, causing the uterus to tear during removal. The parts were extremely vascular, so that in addition to the ligatures three pairs of forceps were left on bleeding vessels for three days (the same extreme vascularity, rendering necessary the use of forceps to stop the bleeding, was found in my other case). The patient recovered from the immediate effects, but gradually failed, and died five weeks after the operation. A post-mortem examination was not made.

Description of the Specimen (fig. 1).—The uterus measures 9 cm. in length and is covered with adhesions. On its surface are seen two small fibroids of the size of a pea and bean. These are fibromyomata undergoing hyaline degeneration, under the microscope. The cut surface of the uterus is scorched in places by the cautery. The uterus has been laid open. The wall is 1 cm. thick. The rim of the external os, and the lower 5 mm. of the canal, are unaffected, but the whole of the rest of the cervical and lower corporal cavity up to within 2 cm. of the fundus is occupied and distended by a ragged growth, ulcerated in places, and in others occupied by polypoid projections. A section of the upper cervical wall shows that the growth has penetrated the wall to within 2 mm. of the outer surface. In the upper part of the body is seen a smooth polypus of the size of a haricot bean, and near it a smaller irregular shaped polypus of the size of a pea with a pedicle about 2 mm. in diameter. The mucous membrane of the body of the uterus elsewhere is atrophied and its surface smooth.

Microscopic Structure.—(*a*) *The smooth polypus* of the size of a haricot bean remaining in the body is a mucous polypus, covered in great part with columnar epithelium and containing glands lined with a single layer of columnar epithelium, some of which are dilated and occupied by shed epithelial cells. The stroma shows in places dense connective tissue, but there is no sign of malignant change in the glands or stroma.

(*b*) *The smaller irregular-shaped polypus* seen in the body of the uterus is similar in structure to the larger polypus, but at one spot there is definite sarcomatous change in the stroma, the cells being large and mostly spindle-shaped. Many of the glands in this polypus are surrounded by an area of hyaline degeneration which stains red with eosin. The stroma cells in this area are much enlarged and some are vacuolated: they might be mistaken for sarcoma cells, and I think they may be the same as the "periglandular sarcoma" of Winter and Ruge; but there can be little doubt that the cells in my case are merely swollen and degenerated. The occurrence of these swollen hyaline cells around the glands suggests that the secretion or discharge sets up the degeneration and perhaps is the cause of the sarcoma also.

(*c*) *The main ragged growth* in the body is a carcinoma, consisting of tubules lined for the most part with a single layer of columnar epithelium which deeply penetrates the muscular wall. The epithelium in places shows some tendency to proliferate and form papillary ingrowth into dilated cavities (fig. 2). In some parts the tubules are embedded in a fibro-muscular stroma having the usual appearances; but in other parts the stroma consists of large spindle cells with

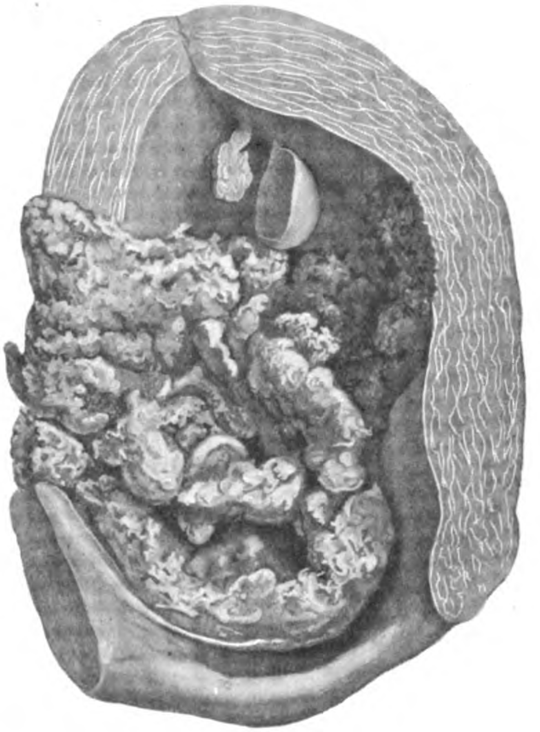

FIG. 1.

The uterus laid open showing the large ragged carcinoma in the lower body and upper cervix. On the right side is seen a dark raw surface, to which the spindle-cell sarcoma was probably attached. In the upper part of the body are seen a smooth mucous polypus of the size of a haricot bean, and a smaller irregular mucous polypus which shows sarcomatous change in the stroma.

capillaries running between them, having the typical appearances of a spindle-cell sarcoma, and contrasting distinctly with the normal stroma in its immediate neighbourhood (fig. 2).

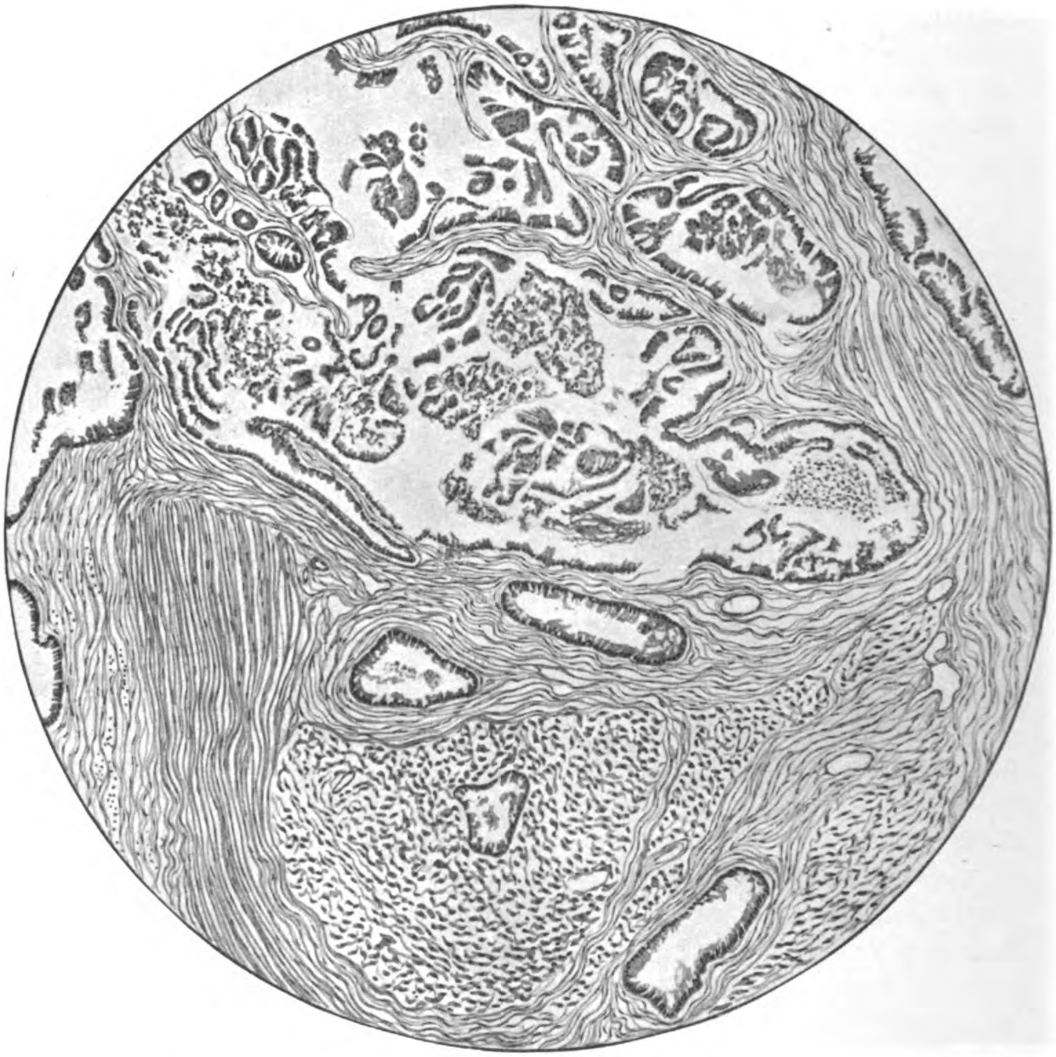

FIG. 2.

Section of the carcinomatous growth showing adeno-carcinoma with some papillary ingrowths, deeply invading the muscle. Below are seen two areas of spindle-cell sarcoma, in one of which is seen a gland lined with desquamating columnar epithelium. The sarcoma cells contrast distinctly with the fibro-muscular cells of the stroma. The great bulk of this tumour is adeno-carcinoma, but there are a few other patches of sarcoma. In only one patch is there an included gland, which has been figured as interesting in connexion with the microscopic structure of the small irregular-shaped polypus (*see b*, p. 84).

(*d*) *The polypus removed before the hysterectomy* shows the typical appearance of a large spindle-cell sarcoma (fig. 3); but scattered through the sarcoma are seen a few uterine glands the epithelium of which is commencing to proliferate and in two or three places has formed large masses of epithelial cells having the appearance of squamous cells. The glands are clearly carcinomatous (fig. 3).

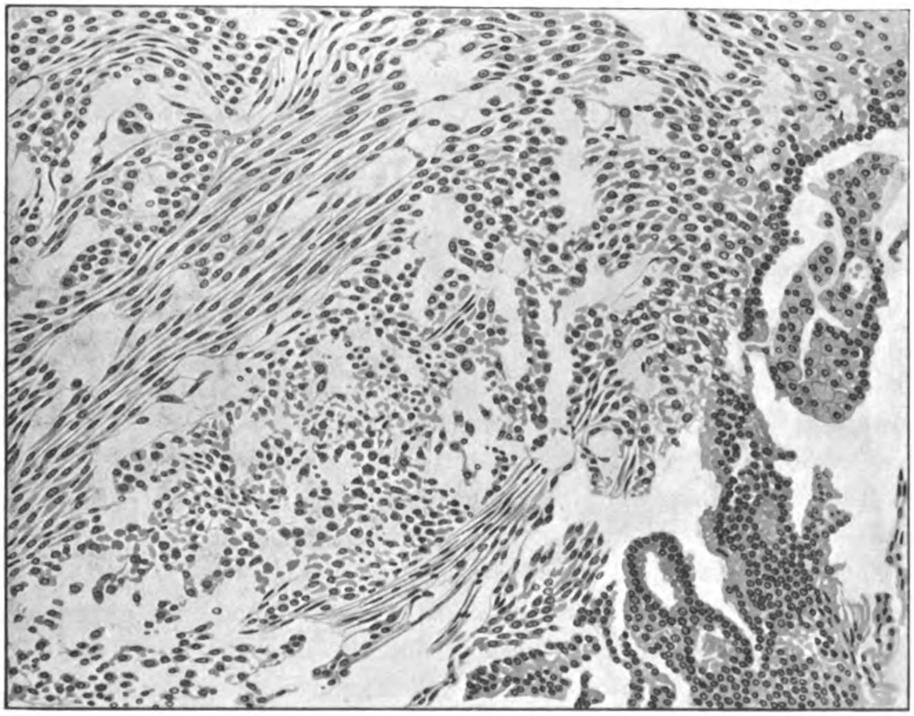

FIG. 3.

Section of the sarcomatous polypus removed before the hysterectomy. The growth is a large spindle-cell sarcoma. On the right is seen a cancerous area made up of the proliferation of glandular epithelium. Several of these carcinomatous areas and glands were found sparsely scattered through the sarcomatous growth.

[Photomicrographs of this growth, made in the laboratory of University College Hospital Medical School by Dr. Butterfield, were exhibited, showing the typical sarcoma and the carcinoma involved in it.]

The polypus removed before the hysterectomy was probably attached at the site of the rough area seen in the right side of the body (fig. 1).

It is impossible to say in this case whether the carcinoma gave rise to the sarcoma, or vice versa. From the more extensive growths of the carcinoma it is probable that it gave rise to the sarcoma, a probability increased by the proved possibility of producing sarcoma experimentally in animals by inoculation of successive strains of carcinoma.

The occurrence of definite sarcoma in the stroma of the little narrow-stalked fibro-adenomatous polypus, which shows no other sign of malignancy, is noteworthy.[1]

(*March* 1, 1917.)

Simultaneous Bilateral Tubal Pregnancy.

By Cuthbert Lockyer, M.D.

On the night of April 28, 1916, I received an urgent message to go into the country to see a lady who was very ill and who, five days previously, was thought to have had an abortion. On my arrival at midnight I found the patient suffering from very severe pain in the lower abdomen, both sides being equally affected. The pulse-rate was 140, the beats were scarcely perceptible, and the patient was blanched, restless, and evidently in extreme pain. On examination the abdomen was distended, rigid, and tender. There was a mass on the left side rising nearly to the level of the umbilicus. Its outline was indefinite below and towards the mid-line, but its upper limit was easily made out. On the right side there was extreme tenderness and rigidity, but no swelling could be felt. *Per vaginam* the os was patulous and the cervix soft. The uterine body was enlarged and anteverted. Behind the uterus, the pouch of Douglas was filled with a tender mass which on the left side felt solid, but on the right was less firm and more ill-defined.

On inquiry into the history of the case I learned the following facts: The patient was aged 26. She had been married fourteen months. The monthly periods had been regular until February. There had been no period in March, but a blood-stained discharge started about April 1 and had continued daily. For this reason the patient had kept to her bed during the whole month of April up to the time of my visit. On April 20 sharp colicky pains started, and on April 23 a membrane was passed *per vaginam*. At that time this was thought to constitute an abortion. The next day, however, a swelling appeared in the left iliac fossa and the abdomen became greatly distended. There had been no sickness. On April 27-28 the patient became much worse. There was an exacerbation of pain, which was now generalized over the whole lower abdomen, and the doctor telephoned requesting me to come prepared to operate. Laparotomy 2 a.m., April 28, 1916. The abdomen was full of fluid blood and blood-clots. The bleeding was proceeding from the right side of the pelvis so that the right infundibulo-pelvic fold was speedily clamped and the clots cleared away. The right Fallopian tube was distended with clot, the latter projecting through its patulous abdominal ostium. The tube and ovary were matted together by clot and held by adhesions to the side and back of the uterus, so that the right appendages could only be separated and drawn up with great difficulty. The right tubo-ovarian mass was removed. There was still a large tumour to be dealt with on the left side of the pelvis and I found that the disturbance in drawing up the right prolapsed appendages had caused the left-sided mass to bleed afresh (the left side had appeared to be quiescent when the operation was begun). On investigation I found a large sac with very thick adventitious walls occupying the left half of the pelvis. It was very difficult to peel this structure off the rectum and sides of the pelvis; in fact, a portion of the sac-wall had to be left attached to the bowel. A large solid clot containing a central amnial cavity was found in the sac, but no embryo was seen. The left tube, which had apparently ruptured, was removed together with a small strand of adherent ovarian tissue. The uterus, which was enlarged, was not removed. The operation was long and tedious (seventy-five minutes) and the difficulties were aggravated by poor illumination, the nurse having fainted and the anæsthetist having to perform the double task of holding a hand-lamp and keeping up the narcosis. Saline injections were administered after the patient was put back to bed, and following a desperate struggle for life, the patient made a complete recovery. This case is a very tragic one, for the young lady had ardently expressed the noble wish to be a mother of twelve children.

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[1] For report of Pathology Committee *see* p. 134.

PATHOLOGICAL REPORT.

The tissues removed consist of the right Fallopian tube and right ovary (fig. 1, **A** and **B**), also the left Fallopian tube and a segment of the left ovary (fig. 1, **C** and **D**).

The right tube is widely dilated, its outer surface is roughened by adherent blood-clot and adhesions. It measures 9 cm. in length and 3 cm. in its transverse diameter. It is slightly bent upon itself and projecting through the abdominal ostium is a clot which covers the posterior aspect of the ampullary portion of the tube and also the upper half of the ovary. In the centre of this adherent clot is an irregular aperture leading to a rent in the wall of the tube at the junction of the floor and posterior surface. This rent is situated 1·5 cm. from the patent tubal ostium: it runs parallel with the long axis of the tube and is 1·2 cm. in length. It is not seen in fig. 1, **A**, which represents an *anterior* view of the right adnexa. On dividing the right tube longitudinally (fig. 1, **B**), its walls are seen to be greatly thinned out and its lumen is divided into three loculi by two transverse septa. The two proximal loculi are empty and show a smooth lining of yellow ochreous hue. The outer loculus is filled with blood-clot, the latter projecting through the ostium, which measured 0·75 cm. in diameter. Beneath this clot is the rent referred to, and which is seen to communicate also with the central loculus on the other side of the dividing septum.

The right ovary measures 4 cm. by 2·8 cm. It is matted to the Fallopian tube by the adhesions and blood-clot which lie around the rupture. A large part of its anterior surface is also covered with clot (fig. 1, **A**). On section the organ is seen to be œdematous and cystic. No recent corpus luteum can be seen.

The left Fallopian tube (which was in communication with the large adherent sac limiting the big hæmatocele) is smaller than its fellow of the opposite side; in length it is 6 cm., and measures 2 cm. in diameter. It forms an oval swelling, with its outer end closed and covered by blood-clot. Beneath the tube the mesosalpinx has been opened up by blood-clot (fig. 1, **C**), and on dividing the specimen longitudinally it is seen that the floor of the tube has given way so that the lumen, which is full of clot, communicates with the hæmatoma in the mesosalpinx. The latter has also been torn right across, leading no doubt to a communication with the adventitious sac, which reached up into the abdomen. The left ovary is represented by an irregular tag of tissue (fig. 1, **C** and **D**) adherent to the engorged mesosalpinx.

Microscopy.—The left Fallopian tube was sent to the Laboratories of Pathology, 38, New Cavendish Street. The right tube was cut and examined in the laboratories at Charing Cross Hospital.

The Right Fallopian Tube.—A vertical longitudinal section taken through the site of rupture shows the tube-wall to be thinned out and very degenerate, the nuclear staining is lost and the fibromuscular fibres are only distinguishable by their arrangement—they are overlain by a lamina of blood-clot to which a few chorionic villi adhere. Within the distended lumen are seen a few plicæ, cut in longitudinal section, but these are not traceable to their attachment. There are many chorionic villi surrounded by syncytium (fig. 2), with deeply staining nuclei, and which gives off plasmodial buds. Lying free in the clot are also

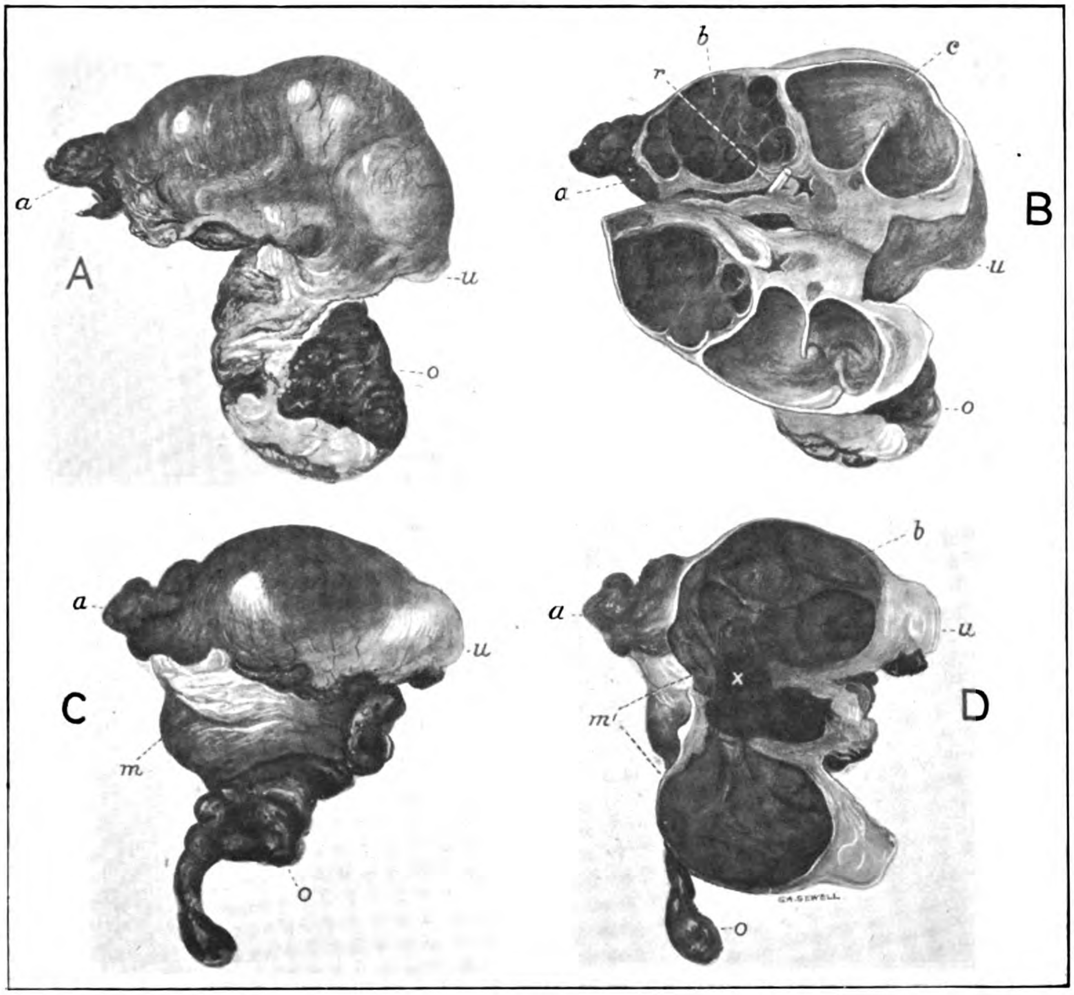

FIG. 1.

Simultaneous bilateral tubal pregnancy. **A**, right tube and ovary ; **B**, right tube laid open longitudinally ; **C**, left tube and portion of ovary. **D**, left tube opened longitudinally ; *a*, abdominal end of tube ; *u*, uterine end of tube ; *o*, ovary ; *b*, blood clot ; ×, rent in floor of tube ; *c*, cystic portion of right tube ; *m*, mesosalpinx ; *m'*, site of rupture of mesosalpinx ; *r*, site of rupture of tube : approximately three-quarters natural size.

numerous syncytial derivatives in the form of large multinucleated and mononucleated cells.

The Left Fallopian Tube.—Sections were taken in the longitudinal direction from a portion of the tube-wall where the musculature was

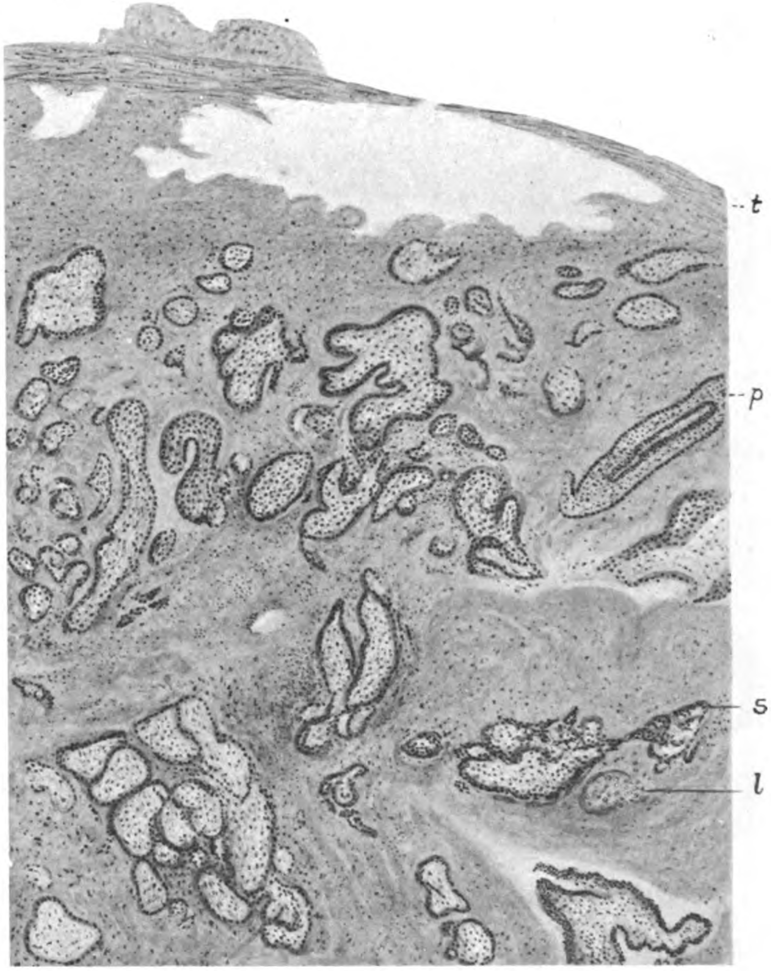

FIG. 2.

Simultaneous bilateral tubal pregnancy. Right tube near site of rupture. *t*, tube wall; *p*, plica; *s*, syncytial buds; *l*, cluster of Langhans' cells. (× 160.)

best preserved (fig. 3). They show the peritoneal coat to be thickened, and also in places covered with blood-clot. The intermuscular capillaries are engorged, and some are ruptured, causing interstitial hæmorrhages.

The plicæ have disappeared and their place is taken by branching chorionic villi which have attached themselves to the tube-wall. Deep to this attachment are seen other villi (divided in transverse section), and also many multinucleated cells and bands of syncytial protoplasm. The areas of invasion of the tube-wall show marked necrosis of muscle-tissue and blood-extravasations. Attached to a villus larger than the rest is a large mass of mononuclear cells with clear cytoplasm—evidently derivatives of the layer of Langhans. Judging from the similarity of the villi in each tube, both as regards their development and staining properties, it is fair to assume that conception occurred simultaneously in the right and left oviducts.

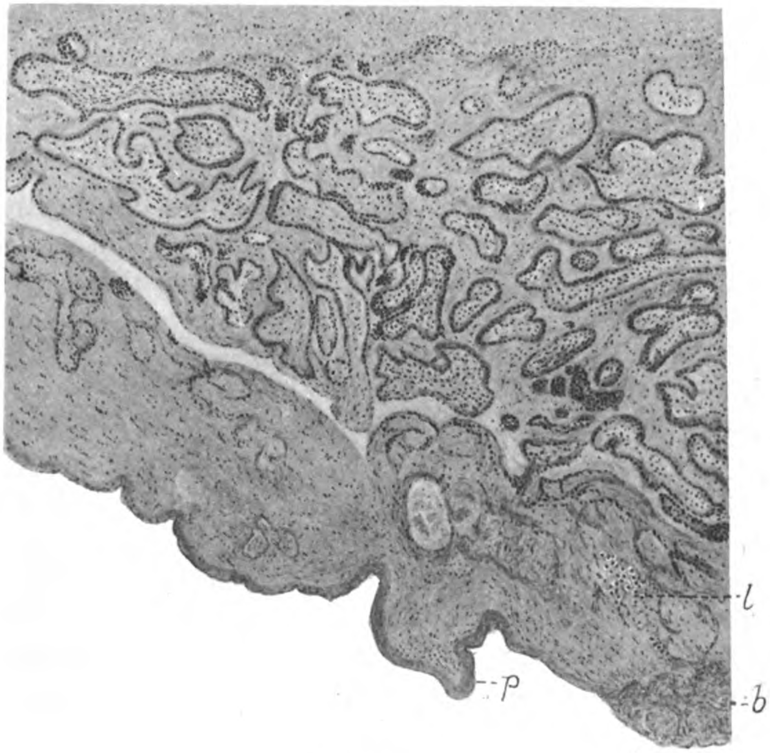

FIG. 3.

Simultaneous bilateral tubal pregnancy. Section through left tube, showing the villi invading muscular wall: *l*, Langhans' cells adherent to villus; *b*, adherent blood-clot; *p*, peritoneum (thickened). (× 160.)

With intra-uterine gestation multiple pregnancy, occurring as it does in about one in eighty cases, is a fairly common incident; with extra-uterine gestation multiple pregnancy is an event of sufficient rarity to justify it being recorded. The cases reported fall into three classes:—

(I) Co-incident intra- and extra-uterine pregnancy.

(II) Multiple pregnancy in a single Fallopian tube.

(III) Co-incident pregnancy in each tube: (*a*) Cases of successive or repeated gestation; (*b*) cases of simultaneous binovular gestation.

Class I is said to include the greatest number of cases and Class III the fewest. But for the latter part of this statement to be correct it is necessary to exclude from Class III (*a*) those cases in which the pregnancy of one tube is of older date than that of the other (a condition to which the term " twin-pregnancy " does not strictly apply, the pregnancy being successive or repeated). This reservation leaves in Class III only (*b*) the examples of simultaneous bilateral binovular pregnancy, which, from a careful survey of all the published cases, I have no doubt is the rarest form, not only of tubal pregnancy but of ectopic pregnancies in general—i.e., even when authentic ovarian gestation is included. I have satisfied myself that there are forty-one cases of genuine ovarian pregnancy in the literature, but can only find about thirty cases in which *simultaneous* pregnancies in both tubes have been proved. The question of abdominal pregnancy for the genus *homo* being unsettled, cases reported as such need not be considered. I can advance no figures to prove the relative frequency of the above three classes of multiple pregnancy; but in an excellent paper on the subject McCalla [15] states that he has found reported twenty-five cases in which *both* tubes were the seat of gestation, as compared with thirty-six, in which twins were situated in a *single* tube. The twenty-five bilateral cases in McCalla's list include both the repeated and the simultaneous varieties. It would appear from a survey of these same cases, made by two other authors (Proust and Buquet [21]), that only seven belong to the simultaneous type. It is to be hoped that McCalla will himself at some future date undertake to dissect these cases, and any subsequent ones, from the point of view of the rare *simultaneous* variety. The most remarkable case of Class II is that of Professor Treub of Amsterdam, in which a single tube contained quintuplets. But as we are not concerned with this class in the present paper further mention of *unilateral* multiple gestation will not occur. The literature devoted to bilateral tubal pregnancy is already fairly extensive. The subject attained considerable prominence in the British Empire in the years 1890-92 by the publications of Rowan [23], Doran [7], Savage [24], and Walter [27]. Since this date it has only been dealt with at long intervals by British writers—i.e., by Haig Ferguson [8], 1899, Burford [3], 1905, McCann [16], 1906, Wilson [29], 1910, Tenison Collins [5], 1912, Lancaster and Moncrieff Barron [13], 1912 and Christopher Martin [18] 1913. The cases of Burford, Lancaster and Collins are the only *positive* examples of the rarest type of tubal pregnancy, simultaneous gestation in both tubes having been proved in each of these three cases. In Wilson's case [29] no chorionic villi were found, but the two tubes were ruptured and each showed decidual reaction. On this alone the case is accepted as positive by the French authorities (Proust and Buquet), who agree with the author in regarding it as the first authentic case ever published in Australia, thereby excluding Rowan's previously reported case, as I also have been obliged to do. My opinion about Wilson's case is that had the tissues been examined by a gynæcological pathologist probably villi would have been found; in point of fact they were examined by a veterinary surgeon. The earliest cases, those of Rowan and Savage, are not conclusive, and the report which Mr. Christopher Martin has been good enough to send me relating to his own case contains no histological record. Much to my regret, therefore, this case cannot be counted in my list (*see* remarks at end of this article). McCann's [16] case belongs to Class II—i.e., it was a case of uni-ovular twins with a single implantation. Ferguson's was a good example of *successive* or *repeated* tubal pregnancy, and the same applies to Walter's [27] most interesting case in which the clinical history showed that the patient missed a period in 1891 and was ill in bed for a month afterwards. A mass the size of an orange was found on the left side when she was examined in August, another period was missed in January, 1892, and after seven weeks' amenorrhœa a new "swelling" was found on the right side of the uterus. At the operation the pregnancy on the left side was found to be much more advanced than that on the right. In spite of these facts this case is included in eight "authentic" cases published by Labhardt [12] in 1909. This is the more remarkable because this writer notes that most authors do not insist on simultaneity, and stating that this ought to be done, he proceeds (quite rightly) to exclude the cases of Rowan [23], Doran [7], and Savage [24]. Similarly Launay and Séguinot [14] *accept* Rowan's case, which was clearly one of *unilateral* tubal pregnancy with hæmatosalpinx of the opposite side. In the same way Proust and Buquet retain only six of Jayle and Nandrot's twenty-nine cases. It should, however, be stated in this connexion that Jayle will not admit the possibility of bilateral tubal gestation ever being simultaneous, and therefore did not, of course, attempt to prove that any of his cases were such. It is clear, therefore, that individual estimates are open to criticism, but as they afford an approximate estimate of the truth, they are not to be deprecated, especially as their compilation entails a vast amount of tedious labour such as only the few will undertake. I have carefully studied Doran's case in which the left tube, though ruptured through its ampullary portion with the corresponding ovary showing a ripe corpus luteum, no chorionic villi could be found in this tube; whilst on the right side the tube contained microscopic evidence of a molar pregnancy. I can well understand how it is that some writers include this case in their series. I agree with Proust and Buquet [21], however, in excluding it from a list purporting to contain authentic cases only. This is probably the right course to take in spite of the fact that I know of no other example of rupture of a hæmatosalpinx pure and simple (d'un hématosalpinx banal). My own case is therefore the fourth proved example of simultaneous bilateral tubal pregnancy to be published in British literature and the third example obtained in England.

I had assigned to myself the task of collecting all the hitherto unpublished examples of simultaneous bilateral tubal pregnancy when I found, with some relief, that the work had already been done up to 1914 by Proust and Buquet. These French authors reviewed eighty-two cases of bilateral tubal pregnancy and found among them thirty-three which they accept as genuine instances of simultaneous gestation. A complete bibliography is appended to their most valuable memoir, which forms the best account on record of this interesting and rare condition. Since this monograph appeared the War has intervened and very few cases have been published, but I find that the following are not included in Proust and Buquet's list, although they mention one of them (Hadden's) in the text.

(1) A case of double tubal pregnancy by David Hadden [10] is quoted in the *Zentralblatt für die gesamte Gynäkologie und Geburtshilfe*, November 5, 1913. The original article is only to be found in the *Californian State Journal*, and as this periodical is not to be obtained in London, I have been unable to test the validity of this case.

(2) Max Cheval [4], "Un cas de grossesse extrautérine simultanée des deux trompes avec avortivement tubaire bilatéral et formation d'hématoceles bilatérales." The patient, a quartipara, was aged 38; labours normal, the last one fourteen months previously; since then quite regular. Last period May

27, 1913. June 15: Uterine hæmorrhage, with pain in left side, followed by a brown discharge; tumour in left iliac fossa noticed four weeks later. Admitted August 20, with a tumour up to navel. Operation, August 23: Villi were demonstrated in the right tube and in the left hæmatocele.

(3) Crousse [6], "Deux cas de grossesses tubaires bilatérales." (*a*) Patient, aged 35, nullipara, taken ill eight days after last period. During the next month a large hæmatocele formed. Right tubal abortion and a left hæmatocele containing gestation products of older date; recovery. (*b*) Patient, aged 38, one partus seventeen years previously; one abortion fifteen years ago. Hæmorrhage continuous since last period. Frequent fainting and severe pain. Large retro-uterine hæmatocele caused by left tubal abortion. Right hæmatosalpinx with a dead ovum inside. Probably simultaneous age. Recovery.

(4) Mr. Christopher Martin [18] has kindly sent me the following letter: "I have looked up the notes of the case of bilateral tubal gestation I reported at the Midland Obstetrical and Gynæcological Society in December, 1913. The patient was a Mrs. Y., aged 38, of Walsall. She had had no children, previously, but three miscarriages. Her periods were regular till July, 1913. Then she had irregular hæmorrhages with one severe loss in August. I operated on her in a private home on October 30, 1913. I opened her abdomen and found she had (i) six small myomata of the fundus of the uterus; (ii) a cystic left ovary; (iii) double tubal gestation. Both tubes were full of old clot, there being a 'mole' in each tube. There was a large hæmatoma (localized intraperitoneal hæmatocele) in connexion with the left tube. There was no sign of a fœtus in either tube, but the mole had the ordinary placenta-like appearance, though no microscopical examination was made. I removed both tubes, the left ovary, and the body of the uterus (sub-total hysterectomy). The patient made a good recovery and left on November 25, 1913. I believe the specimen is in the Pathological Museum of the University of Birmingham. From the appearance of the tubes I believed that the pregnancies were simultaneous." (See note at the end of this article.)

(5) Phahl, F. [20]. "Gleichzeitiger Schwangerschaft beider Tuben.' Ruptured left tube and right-sided tubal hæmatoma with tubal abortion. Chorionic villi in each tube. Corpus luteum only in left ovary.

It is possible that all these five cases are genuine, but with scanty references, or in the absence of histological data, it is impossible to be certain of four. There need be no doubt, however, in accepting the case of Max Cheval. This would appear to bring the number of published cases of simultaneous bilateral tubal pregnancy up to thirty-four, making my own case the thirty-fifth. This estimate of "proved" cases is, in my opinion, too high, because I cannot bring myself to agree with Proust and Buquet in accepting as valid the proofs of simultaneity advanced in the cases of Launay [14], Robins [22], Weinlechner [28], Savage [24], and Balleray [1], and I have doubts in the cases of Greenberg [9] and Sussmann [25]. This means that I am disposed to exclude at least five, if not seven cases of Proust and Buquet's thirty-three; in Launay's [14] case (which is interesting from the fact that on the right side there were two small fœtuses whilst on the left there was a three months' fœtus and its placenta) the evidence of simultaneity is not forthcoming, at any rate it is open to doubt. In Robins's [22] case there is no histological record, and Proust says, "We *suppose* that it was a simultaneous bilateral pregnancy"; the evidence being that the right tube, which was not ruptured, contained an ovum, and that the left was ruptured with an ovum adherent outside. What is the evidence of simultaneity?

Weinlechner [28] reported that the two tubes in his case were filled with clot, and that two corpora lutea were found, but he gives no histology of either tube and makes no mention of embryos. In the case of Savage there was no microscopic examination and no embryos were found. In Balleray's [1] case there was a fœtus in the right tube, and we are told that the left tube was the seat of an ectopic gestation, but, as Proust himself points out, Balleray gives no account of the examination of this tube. It should, therefore, be excluded from a list of simultaneous pregnancies. In the example of Greenberg [9] the left tube was filled with blood-clot and ruptured. The right tube was adherent to, and had perforated, the bladder, causing copious hæmaturia. No histological account is given. Proust and Buquet say "We are inclined to think that the gestation was simultaneous but the rupture perhaps successive," a conclusion evidently based on clinical grounds only; this may or may not be right. In Sussmann's [25] case the right tube showed, "without any doubt," that there had been a tubal abortion, so that a microscopic examination was not considered necessary, especially as in the clots, which were removed from the pelvis and which were subsequently lost; the debris of an ovum had been seen at operation. A few villi were found in the ruptured part of the opposite tube. Query as to evidence of simultaneity.

I wish to draw attention to these defects in the presentation of cases for publicity, because I hold that for the settling of the question of simultaneity, not the clinical bearing of the cases only, but also the macro- and microscopical details, should be fully reported. Not only is it impossible to decide this question on clinical data alone, but it is absolutely essential to base the final conclusion on histological evidence. Where this is wanting the cases may be dealt with as Whitridge

Williams disposes of those which purport to be examples of ovarian gestation—i.e., by classifying them as (*a*) highly probable, (*b*) probable, (*c*) doubtful. But for the present purpose I am content to exclude the above cases from the list of positive examples on the grounds that the proofs are incomplete. This leaves 33 − 7 = 26 cases in Proust and Buquet's list; 5 − 4 = 1 in the list I have made from cases subsequently published; and, finally, the case which forms the basis of this paper, thus making a total of twenty-eight cases of simultaneous bilateral tubal pregnancy to date.

DIAGNOSIS.

It is practically impossible to make a *clinical* diagnosis of simultaneous bilateral tubal pregnancy. There is more chance of coming to a correct conclusion in successive bilateral cases as seen in the case of Walter [27], in which one tumour was detected some months before the other, and the appearance of each was preceded by a very suggestive illness.

Definite attacks of pain starting on the one side and then on the other have been noted, but in no case does the correct diagnosis appear to have been made, or even suggested, before operation. With the abdomen opened it may be easy to observe a tubal lesion on both sides; on the other hand there are instances where the bilateral nature of the lesion has been missed, necessitating a second operation (e.g., Boisleux's [2] case seven weeks later). When operating for extra-uterine gestation it is, therefore, most essential *to examine the appendages on both sides.* Even if the opposite tube be not the site of a gestation sac it is no infrequent occurrence to find it presents a hæmatosalpinx.

The coincidence of a hæmatosalpinx and tubal gestation has given rise to much speculation as to the causation of the tubal gestation. Doran [7] thought that it was caused, in his case, by a leak from the gravid tube, the blood reaching the opposite tube via the uterus. A more common acceptation is that the hæmatosalpinx (in the absence of torsion) is the result of intense congestion set up by pelvic hyperæmia due to pregnancy. Whatever the cause it is clear that a differential diagnosis between hæmatosalpinx and a gravid tube can only be made by the microscope, and it is to be remembered that this is often no easy task. In the case of Unterberger [26] the finding of chorionic villi in the left tube was extremely difficult in spite of the fact that when found they were well stained. The same difficulty arose in the case of Sussmann [25].

When the embryos are both preserved, and are of the same size, the diagnosis of "simultaneity" is assured.[1] But the mere presence of a fœtus on both sides is, of course, of no value in deciding as to simultaneous gestation — embryos of even date may show different developments, since one may die before the other—therefore actual simultaneity will, in some cases, be impossible of proof. Such cases should not be placed in the "positive" series. The existence of rupture, and the appearance of "evident abortion" (a term not infrequently used) when standing alone, only indicate a strong *probability* of bilateral tubal pregnancy. These lesions cannot of themselves decide the question of simultaneous gestation. The finding of two ripe corpora lutea has been advanced as proof of simultaneity (Weinlechner [28]), but, as in the majority of cases, only a single corpus luteum is found. I do not attach importance to this sign.

To sum up the question of diagnosis of simultaneity. It should be based upon thorough macro- and microscopic investigation, and the pathological findings should harmonize with the clinical history of a single impregnation ending in a typical crisis, or in two crises more or less contemporaneous, and in some cases it may be possible to make out that the pain is bilateral in a single abdominal attack.

When the onus of proof lies on the histological findings, the question of simultaneity is based on the character of the villi—i.e., on their relative size, development and staining properties. The villi in one tube should so closely correspond in all their features to the villi in the tube opposite that the sections might be interchanged without detection.

TREATMENT.

The mere fact of a bilateral tubal pregnancy being a possibility is an argument in favour of early surgical intervention during an acute abdominal attack. Although only one side may be ruptured, as in the cases of Johnson, Findley, Proust and Buquet, there may be an equally serious lesion on the opposite side in the shape of an abortion, and, in general terms, it may be said that a patient incurs a double risk from the double lesion. In my own case, the patient was on the verge of death, and her extremity may have had to do as much with the additional pain as with the extensive hæmorrhage. The question of leaving or removing the uterus arises. It may be easier and quicker in certain cases to perform subtotal hysterectomy, removing both tubes and uterus *en masse.* I left the uterus and a portion of an ovary, and I feel sure that this was the right thing to do, especially as I hear by letter that the lady, who is now in America, is deliberating on the advice of a surgeon on the other side who wants to engraft the ovarian tissue into the uterine cornu with a view to favour conception. I do not think this effort, if made, would succeed, but there is no doubt that, from the patient's point of view, the possession of a menstruating uterus is a mental satisfaction as well as a physical asset.

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[1] This was found in the case of Burford, in which the fœtus on the right side measured 38 mm., that on the left measured 41 mm. Each tube contained an embryo of about eight weeks' development in the case published by McCalla [15]. In Milligan's [19] case, each tube was said to contain a fœtus of three months' development. In Launay's [14] case there were twins on the right and a single fœtus of three months' development on the left side. In McDonald and Krieger's [17] case, each tube contained a fœtus. In Collins's [5] case in the left tube there was an amnial sac, 5 cm. by ½ cm., without a fœtus, and in the right tube there was a fœtus 5 cm. long.

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DISCUSSION.

Dr. GRIFFITH: Has Dr. Lockyer taken into consideration another difficulty in determining, by examination of the specimens, "simultaneity" or not of double tubal pregnancy—namely, the changes in the chorion and sac wall which will arise in the event of the arrest of development of either embryo? The mere size of the sacs will be no guide even if both embryos are living, and may depend only on the amount of blood effused into them.

Dr. H. R. SPENCER: Does Dr. Lockyer claim that he can decide on the date of the pregnancy by microscopic examination of the villi? If so, it seems a large claim, in view of the remarkable way in which villi retain their vitality in some cases of retained ovum. I have published a case where a villus stained well after remaining thirteen months in the tube.

Dr. LOCKYER (in reply): The questions raised by Dr. W. S. A. Griffith and by Dr. Herbert Spencer will be found to have been answered in that part of the paper which I omitted to read for want of time. In simultaneous bilateral tubal pregnancy, when one embryo died before the other, it is impossible, after a considerable lapse of time, to *prove* simultaneity. Such cases should therefore be described simply as "bilateral tubal pregnancies" and the question of simultaneity should be left *sub judice*.

P.S.—At my request Mr. Beckwith Whitehouse has kindly sent me sections prepared from the two Fallopian tubes in the case of Mr. Christopher Martin. I find a few old villi in sections taken from "Tube No. 1" (presumably the left tube), but in "Tube No. 2" there are no microscopic evidences of gestation.—C. L.

(*March* 1, 1917.)

Metastatic Glioma (Neuro-epithelioma) of the Right Ovary in a Child aged 3.

By CUTHBERT LOCKYER, M.D.

I AM indebted to Mr. Norman Fleming for permission to show this extremely rare specimen. Being present at the autopsy of the patient, which was made in the Charing Cross Hospital, I was consulted as to the condition of the right ovary, and subsequently took charge of the pelvic viscera with a view to their preservation and for investigation.

A paper recording this case was read by Mr. Frank Taylor and Mr. Norman Fleming at the Section of Ophthalmology on November 1, 1916, but this has not yet appeared in the *Proceedings of the Royal Society of Medicine.* I was present at that meeting and here record such details of the paper written by the above authors as may prove of interest to this Section.

Mr. Norman Fleming stated in his clinical notes that the child, L. D., aged 3, was seen by Mr. E. W. Brewerton on February 14, 1916, who admitted her forthwith into the Royal Westminster Ophthalmic Hospital for a fungating growth protruding between the lids of the *left* eye. The right eye was described as being proptosed. The left orbit was exenterated and the right eye freely excised within an hour of admission. On March 11 the child was discharged, and on March 30 was re-admitted with a recurrence of the size of half a tennis-ball protruding from the right socket. This was cleared out on the day of admission, but the patient soon became very emaciated, the right socket filled up again, and death occurred on May 7.

At the autopsy about twenty rounded growths with raised edges, scarlet in colour, caused adhesion of the dura mater to the bones of the cranium; there was also a mass of growth in the position of the optic chiasma. Metastases were found in the mesenteric glands, on the anterior aspect of the body of the second lumbar vertebra and in the right ovary (*see* fig. 1). With the exception of the ovarian growth, the pelvic organs were quite normal. On naked-eye section of the right ovary its centre was seen to be occupied by a blood-clot measuring $\frac{5}{16}$ in. in diameter. This clot was surrounded by an area of new tissue forming a zone $\frac{3}{16}$ in. in thickness. Microscopic sections showed a normal ovarian cortex containing many primordial follicles deep to which came the tissue of the new growth, the characters of which are indistinguishable from those of a small round-celled sarcoma (*see* fig. 2), which I am informed by my colleague, Mr. Treacher Collins, is the usual appearance of this class of growth. Extensive areas of cell degeneration form a marked feature, and this again is said by Mr. Collins to be characteristic. Although resembling a sarcoma in its histology, Mr. Collins states that the growth is of epithelial origin and should be termed a neuro-epithelioma.

Mr. Frank Taylor, whose study of the literature of these cases formed his contribution to the paper read by Mr. Fleming at the Section of Ophthalmology, quotes Wintersteiner's[1] statistics based on

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[1] Wintersteiner, "Das Neuro-Epithelioma Retinae," Leipz. u. Wien, 1897.

497 cases of glioma of the retina. As regards metastases in this series, those in distant organs are as follows: In skeletal bones, nine; liver, seven; ovary, two; kidney, two; lungs, one; spleen, one. These statistics appeared twenty years ago, and, according to Taylor, no other ovarian metastasis has since been recorded in cases of glioma of the retina.

I have myself looked up the literature on the subject, and can find only two cases of metastatic glioma of the ovary, these being the two to which Taylor referred. One was recorded by Heymann and Fiedler,[1] in 1869. The patient was a child, aged 3. The primary disease was unilateral, affecting only the left eye. The tumour was the size of a hen's egg. Four months after the onset of the disease the bulb was extirpated and the optic nerve resected. Recurrence followed two weeks later and death occurred two months after operation. Metastases were situated on the cranium and meninges, underneath the optic chiasma, in the *left ovary* and in the retroperitoneal glands. The age of this patient and distribution of the metastases in the case are practically identical with what has been stated above in reference to the case I now exhibit. The second case was published by Rusconi and Bizzozzero in 1871.[2] The patient was a child aged 1½, who died two months after the growth was first noticed; no operation was performed. There was exophthalmos due to a *glioma retinæ.* Metastases were found between the cranial bones and the dura mater, in the liver, and in *both ovaries.*

Histological Details of Neuro-epithelioma.—The cells composing the growth are for the most part small (8 to 9 μ) and variable in shape, but round and oval cells predominate. They possess a large nucleus (6 to 7 μ) which monopolizes the greater part of the cell, the remaining protoplasm forming only a thin ring around the nucleus. Often the extranuclear cytoplasm is too scanty to be seen even under ⅛ in. objective, and the nuclei appear to represent the entire cell (the "free nuclei" of Virchow and others). Here and there, larger cells with abundant cytoplasm are seen. These are commoner in metastases than in the primary retinal growth. These larger cells may be angular or fusiform

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[1] "Ein Fall von Netzhautgliom mit zahlreichen Metastasen," *Arch. f. Ophthal.*, 1869, xv, No. 2, p. 173.

[2] Rusconi, "Caso di glioma della retina con nodi secondari nel fegato, nel reni negli ovari," *Rendiconti del R. Istituto Lombardo* Serie II, iv, fasc. 5; also, *Rivista clinica di Bologna*, Giugno, 1871, p. 169. Bizzozzero, "Sulla sviluppo del glioma secondario del fegato." *Giorn. dell' Accad. di Med. di Torino*, 10 Maggio, 1871.

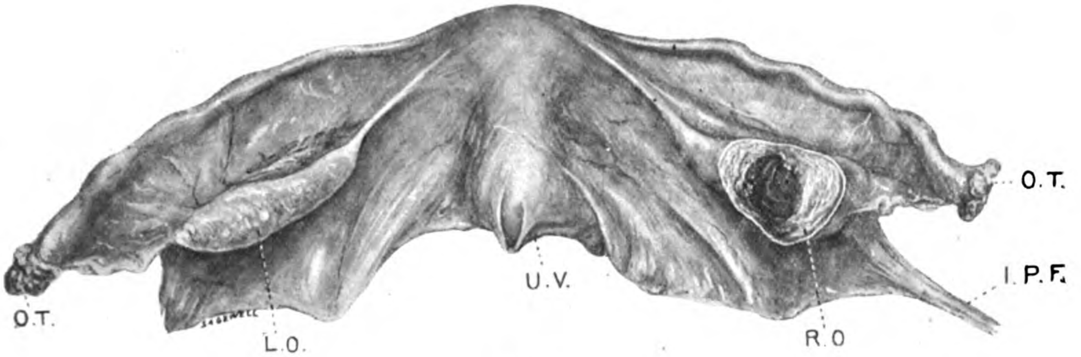


FIG. 1.

Secondary neuro-epithelioma of right ovary in a child, aged 3.

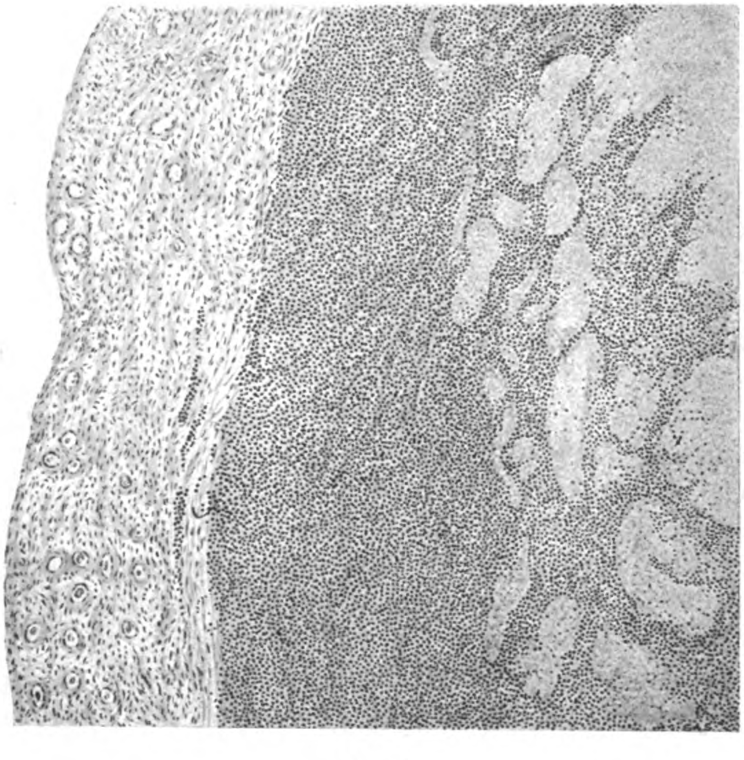


FIG. 2.

Secondary neuro-epithelioma of right ovary in a child, aged 3. (× 105.)

in shape and give off processes, they may also contain more than one nucleus. The intercellular substance is extremely scanty and is scarcely visible except in places where the delicate capillary channels are distended with blood-corpuscles. In the ovarian deposit these capillaries are very numerous and are often widely distended with blood. Their walls are composed of a single layer of flattened cells, which easily give way, leading to disruption of the growth by extensive interstitial hæmorrhages. As already stated cell degeneration is a marked feature of the growth. Fat droplets appear in the cytoplasm of the cells, and large masses of growth may undergo caseation and total necrosis, so that all nuclear staining of the cells is lost, and the vascular system of the tumour, sharing in the process, shows thrombosis and degeneration of blood-vessels.

(*March* 1, 1917.)

Curious Degeneration of a Cervical Tumour.

By C. HUBERT ROBERTS, M.D.

THE specimen exhibited was removed by the author from a patient, aged 35, at the Samaritan Free Hospital for Women on October 12, 1916. The patient had one child, aged 3, and states that since this confinement she has never been really well. She said that her chief trouble was extreme pain in the abdomen, mostly in the left side, and that for the last six months she had suffered with flooding and discharge. For two months before admission she had noticed a lump in the abdomen which was very painful and was rapidly getting larger. Other symptoms were great difficulty with micturition and sometimes retention of urine. On examination of the abdomen a semi-elastic swelling was found rising out of the pelvis to the level of the umbilicus. At its upper border there was a hard mass, (?) the fundus uteri, or a harder portion of the tumour. The whole mass was very tender to touch.

On vaginal examination the following curious condition was found. There was a mass in the roof of the vagina distending and protruding from a cervix which, in midwifery terms, might be designated as "fully dilated," in fact at one time this presenting mass was taken for the bulging membranes of an ovum in the process of extrusion.

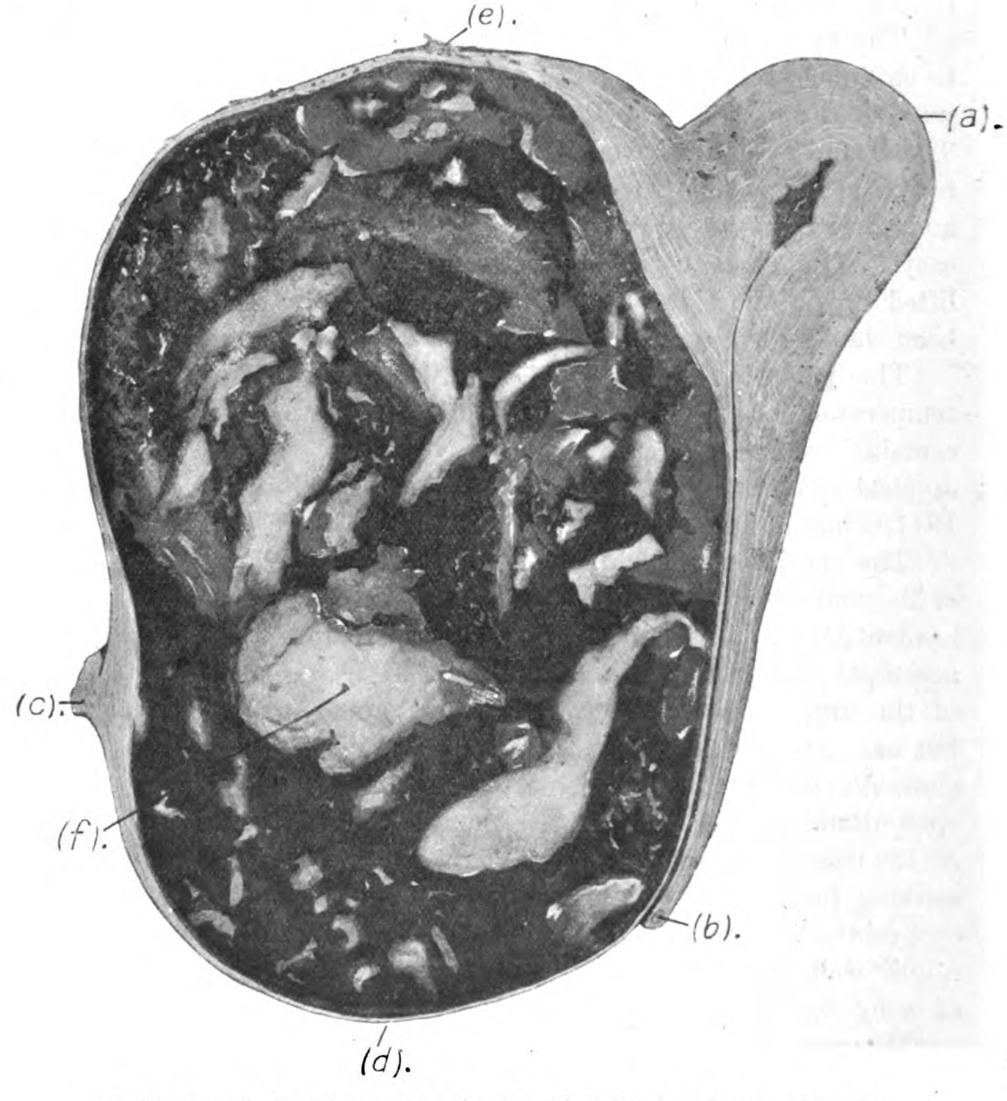
On closer examination, however, the mass was found to be really in the cervix itself, the remainder of the cervix proper being thinned out and distended round the tumour. A sound passed 7½ in. laterally, and the hard mass at the summit of the abdominal tumour was then known to be the fundus uteri. Vaginal examination with a speculum found a soft bulging mass, dark bluish-red in colour, which distended the cervix, and which again could easily have been mistaken for the membranes of pregnancy. Finally the diagnosis of cervical fibroid was made and the tumour removed by panhysterectomy.

The operation was a difficult one as the cystic mass practically had to be enucleated. During the operation the tumour was accidentally punctured and a large amount of dark red débris and fluid escaped. The bladder relations were very difficult, but after stripping it down forwards I was able to reach the anterior vaginal fornix and open it, and after that the remaining stages of the operation were fairly easy. The right ureter was clearly seen to be much dilated and lifted up on the side of the tumour; in fact it might easily have been damaged.

The patient recovered satisfactorily except for a slight rise of temperature on the fourth and sixth day after operation. So far she remains well, but the prognosis is doubtful in view of the microscopical examination. She was carefully examined on February 28, 1917, when her condition was quite satisfactory.

The specimen exhibited is now only half its original size, as much of its contents were lost during its removal. It has been carefully hardened, and on section shows the curious appearances found in the accompanying picture (by Mr. Shiells). It resembles a cervical fibroid of the anterior lip, presenting the usual appearances of such tumours, but has undergone the most remarkable degeneration. The contents show the whole tumour to be necrotic, and of a dark bluish-red colour, with islands of "fibroid" tissue more or less well preserved in places. At the time of removal the contents were of course fluid. One of the striking features of this case is the extraordinary protrusion of the cystic mass into the dilated cervix, which measured 3 in. across. This might well justify such a case being taken for an ovum in the process of being expelled.

Microscopical Examination.—Sections of the islands of tissue from the centre of the tumour show marked degeneration everywhere, combined with hæmorrhage. The cellular elements of the tumour, however, do not resemble those of an ordinary fibroid of the cervix. There is practically very little fibrous tissue present, the cells seen under high power are large and almost uniform in type amid an embryonic stroma, and are very suggestive of sarcoma. Many of the cells are clustered around blood-vessels, some of which are very thin walled, others, however, are thick and like those met with in fibroid tumours. The protoplasmic elements of the cells are too degenerate to determine the condition of the nuclei. Some areas of the tumour show cells apparently developing from the outer coats of minute



(*a*), Fundus uteri; (*b*), posterior lip of cervix; (*c*), anterior lip of cervix; (*d*), bulging mass into dilated cervix; (*e*), site of attachment of bladder; (*f*), island of semi-necrotic tissue (from which the sections were taken) in centre of degenerating tumour.

capillaries (or lymphatics), and yet the condition is not exactly like a perithelioma.

I should very much like to hear the opinion of members of the Section as to the nature of the tumour. The question arises: Is the tumour a sarcoma or a degenerate fibroid? If it be a sarcoma it is not typical on microscopical examination; if it be a fibroid the degeneration is unusual. Lastly, could it be described as sarcomatous degeneration of a fibroid?

Dr. Lockyer has very kindly examined the sections and believes it to be a sarcoma.

DISCUSSION.

Dr. H. R. SPENCER: I have removed two cystic cervical fibroids of about the same size as that shown by enucleation by the vagina, a very simple and safe operation. In both the fluid coagulated after removal. I think the specimen shown is a degenerated myoma, but the microscopic appearances are curious.

Dr. ROBERTS (in reply): I am quite agreeable that the specimen should be referred to the Pathology Committee. As regards the question of vaginal operation in this case I think that, considering the size of the tumour, its degeneration and the extent of uterine tissue involved, the dangers of sepsis and hæmorrhage would have been very great; and, further, that if the uterus had been saved it would have been quite useless as a reproductive organ. In view of the nature of the microscopical sections also, I feel certain that panhysterectomy was fully justified.

N.B.—The Pathology Committee have since reported on the sections and are of opinion that the tumour is sarcomatous (*see* p. 134).

(*March* 1, 1917.)

A Calcified Fibroid which caused Complete Axial Rotation of the Uterus.

By C. HUBERT ROBERTS, M.D.

THE specimen shown was removed at the Samaritan Hospital for Women from a patient aged 55, married; no pregnancies. The periods had ceased for ten years, but previously they had been very profuse.

The patient stated that she knew she had a tumour in the abdomen "for many years" but that it had given her very little trouble. About three months before admission she began to suffer with acute attacks of abdominal pain, which of late had been very severe and accompanied with cramps and sickness; her general condition was good. On examination a large hard swelling could be easily felt in the abdomen, reaching to the level of the umbilicus, more marked on the left side than the right. It was very mobile and could be freely pushed about the abdomen.

On vaginal examination there was a small atrophic cervix; movements of the abdominal mass communicated themselves to the cervix. The fundus could not be determined. The diagnosis was made of a calcified fibroid, ovarian dermoid, or ovarian fibroma. There was no free fluid.

On November 16, 1916, the tumour was removed by abdominal section. It was easily lifted out of the abdominal cavity and was found to be densely hard and very heavy. The remarkable feature of the tumour was its pedicle, the length of which was 8½ in., with the thickness of that of two fingers. It consisted of an enormously elongated senile uterus which, at the level of the supravaginal cervix, had undergone an acute axial twist, two and a half times, the twist being from left to right, forwards. The appendages were included firmly in the twist. The torsion was easily undone and the tumour simply amputated from the fundus uteri, to which it was attached by a pedicle 1½ in. wide. The vessels below the twist were deeply engorged, but there were no adhesions anywhere and no free fluid. The senile uterus and appendages were left *in situ*.

The patient recovered completely, the temperature being normal throughout her stay in hospital.

The tumour exhibited is a well marked example of complete calcareous degeneration of a fibroid; when fresh it weighed 4½ lb. It was so hard that it took a considerable time to cut through, and spoilt two saws in the process.

The importance of the specimen lies in its causing axial rotation of the *uterus*. Axial rotation of the pedicle of a stalked fibroid is not uncommon and may lead to acute degeneration of the tumour, but complete torsion of the uterus itself is very rare. I have not met with a case in my own practice before. Most of the cases reported of axial rotation of the uterus by a fibroid have been only partial—i.e., say half a twist—possibly leading to acute abdominal pain, accumulation of blood or pus in the uterus, or necrosis of the tumour. In my case the twist was two and a half times, but as the uterus was very senile and the pedicle very thin from long traction, such twisting was easily possible, just as occurs in pedunculated ovarian cysts.

Dr. Cuthbert Lockyer kindly permits me to show the picture exhibited.[1] It was drawn from my personal description of the case and accurately portrays the condition found at the time of operation.

(*March* 1, 1917.)

Case of Supravaginal Amputation of Uterus for Sarcoma mistaken for Myoma.

By G. BLACKER, M.D.

THE patient, a single woman, a nurse, Miss H. S., was admitted to University College Hospital on April 26, 1907, complaining of swelling of the abdomen and some œdema of the legs. The periods, which had never been excessive, lasting five to six days, and recurring every four weeks, had ceased six years previously at the age of 38. There was no abdominal pain nor difficulty in micturition and no vaginal discharge. The temperature was slightly elevated, reaching 101° F. at night.

Palpation of the abdomen revealed the presence of a mass reaching up to 1 in. above the level of the umbilicus. It was smooth on the surface, dull on percussion, and over a considerable area on the left side where the wall felt thin it fluctuated and gave a fluid thrill. On vaginal examination the cervix was small and healthy, and in Douglas's pouch there was a mass continuous with that felt in the abdomen and indistinguishable from the uterus. The sound passed the normal distance; there was no thickening of the cellular tissue. The ankles were somewhat œdematous. The diagnosis was thought to lie between a semisolid ovarian cyst adherent to the uterus and a subserous fibrocystic tumour of the uterus.

On May 1 the abdomen was opened and the tumour found to be uterine in origin. The abdominal cavity was packed off, and to facilitate removal the cystic portion of the tumour was tapped, over 2 pints of thick grumous fluid being evacuated. Supravaginal amputation of the uterus was then performed in the usual way, both ovaries being removed and the abdomen closed without drainage, a continuous silk suture being used for the peritoneum, interrupted silk sutures for the fascia, and a subcuticular catgut suture for the skin.

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[1] The illustration will be found in "Fibroids and Allied Tumours," Macmillan and Co., 1917.

The patient made a good recovery except that on one occasion she passed some bright red blood from the vagina. She was quite well when last heard of in May, 1911, four years after the operation.

The specimen shown consists of a slice of the right half of the uterus, together with the right ovary and a portion of the tumour. The ovary and tube are atrophied in appearance, but otherwise normal. On one surface of the slice is seen the uterine wall, measuring about 2 cm. in thickness, with the uterine cavity cut across and containing mucus. In the anterior wall is a small fibromyoma, 2 cm. by 1·5 cm. Growing from the posterior wall of the uterus is a growth waxy in section and breaking down on the surface. The greater part of the growth is occupied by an irregular cavity and posteriorly the wall is very thin.

On microscopic examination the endometrium is found to contain some distended glands and is infiltrated with small round cells. The fibromyoma presents no sign of any sarcomatous change, but is undergoing hyaline degeneration. The section of the tumour shows that it is made up mainly of round and spindle cells undergoing degenerative changes, and that there are present a large number of giant cells with deeply staining nuclei. Scattered throughout the growth are considerable numbers of leucocytes.

Sections of the cervix show perfectly normal structure.

(*March* 1, 1917.)

Two Cases of Supravaginal Amputation of the Uterus for Supposed Myoma found to be Sarcoma.

By HERBERT R. SPENCER, M.D.

IN this short communication I wish to place on record two cases of supravaginal amputation of the uterus for sarcoma, mistaken for myoma. The operations were performed seventeen and twenty years ago. It was these two mistaken diagnoses (which I think could not have been avoided without a microscopic examination) which led me to study the literature and to consider the relative advantages of amputation and total hysterectomy, and to decide very strongly in favour of the total operation, which accordingly I have employed in every case of abdominal hysterectomy for myoma, sarcoma or carcinoma which I have performed during the last sixteen years.

No one will deny that for sarcoma of the uterus total hysterectomy is better than amputation, nor that removal of the uterus whole is better than removal of the body and cervix separately; and no one of experience will deny that cases of myosarcoma occur which cannot be distinguished from myoma at the time of, or immediately after, the operation, but only after careful hardening and microscopic examination of the tumour, sometimes in many places.

These two cases of sarcoma occurred amongst thirty cases of supravaginal amputation for "myoma" (i.e., in 6·6 per cent.), a frequency which is somewhat greater than that generally met with. But sarcoma of the uterus, though rare, is much commoner than is thought by those who do not harden and examine all tumours removed. I have met with more than a dozen other cases. But these two cases now published are the only cases in which I have performed the operation of supravaginal amputation, and they point to one of the disadvantages of the partial operation and one of the points of superiority of the total operation to which I have called attention on many occasions, and which I will endeavour to illustrate in further detail in subsequent papers, one of which is now in the hands of the secretaries of the Section.

Case I.—A. I., aged 50 (children four, abortions nil), was admitted to University College Hospital on March 26, 1896, complaining of swelling of the abdomen, occasional attacks of pain and hæmorrhage. The enlargement of the abdomen was first noticed nine months ago: there was no pain at the time. About six weeks before admission the patient was seized with sudden severe pain across the abdomen, which had continued since and lately had shot down the left leg to the foot; severe pain had also been present in the back. Since the attack of pain the patient had been constipated and a discharge of blood had been present, profuse for the first month, but very slight during the last fortnight. The patient had previously had no severe illness; there was no sign of syphilis; her last child was born nine years ago, and since that time she had not been pregnant. There was no history of cancer or tubercle in the family. Menstruation began at the age of 15, was always regular, lasting seven days and requiring nine to ten diapers, and was very painful. Menstruation ceased two years ago. On admission the patient was pale, fairly well nourished. There was no œdema of the legs, in which venules were visible. The temperature was 100° F., the pulse 140, respiration 24. The heart and lungs appeared healthy. In the right half of the abdomen and slightly passing across the middle line, a well defined tumour was found which reached up to a height of 8½ in. above the pubes and measured 7¾ in. transversely. It did not

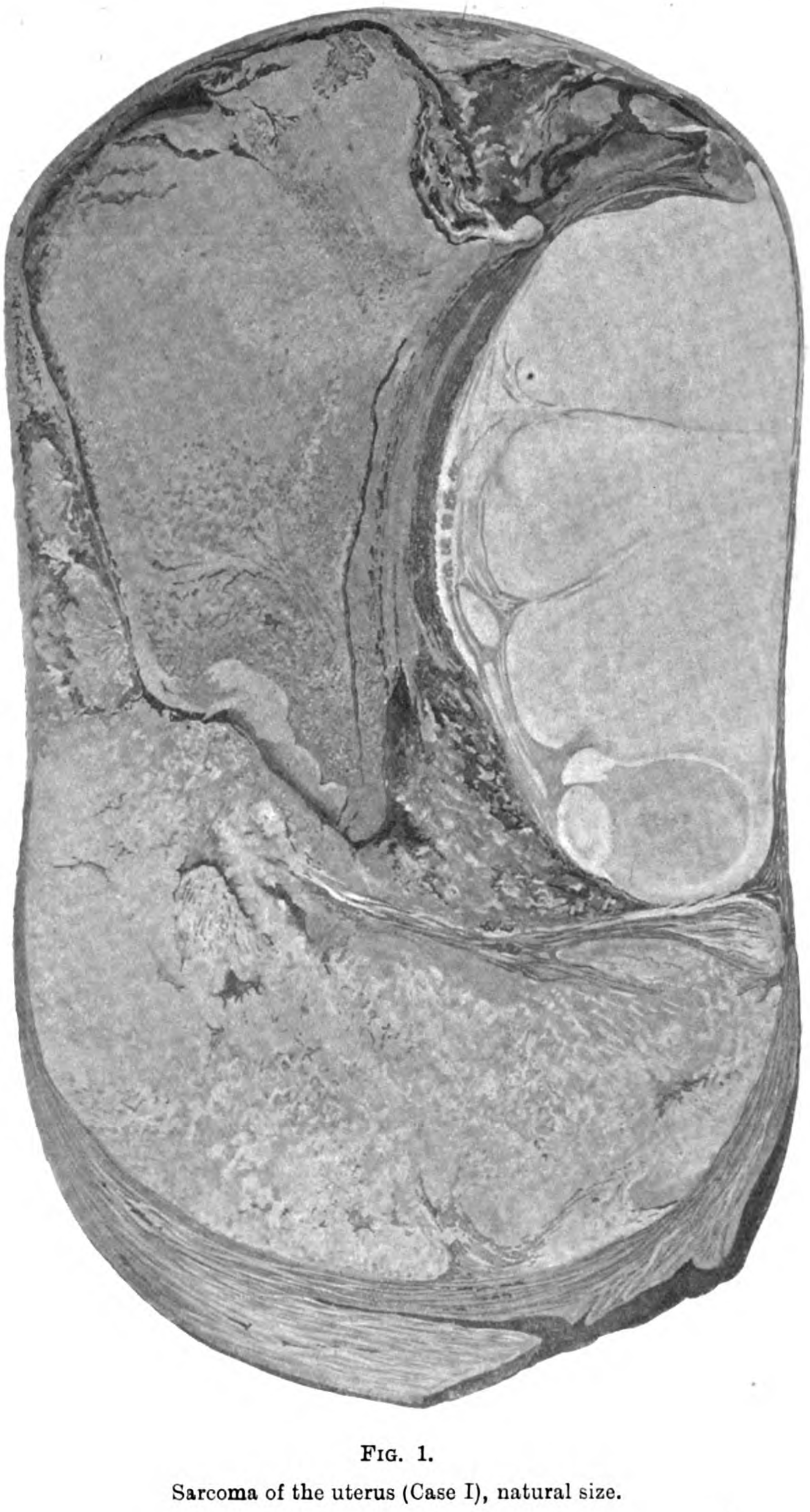

FIG. 1.

Sarcoma of the uterus (Case I), natural size.

move on respiration. The veins in the abdominal wall were enlarged; the umbilicus protruded. The tumour felt like a tense cyst, giving the signs of dullness, fluctuation and thrill. The cervix was normal: the sound was not passed. The tumour appeared to be separate from the uterus and was diagnosed as a tense ovarian cyst. At the operation on March 30, 1896, a smooth, apparently cystic, tumour free from adhesions was found growing from the fundus uteri: it was thought to be a fibroid: large veins coursed over its surface and were also seen in the broad ligaments. Supravaginal amputation was performed with subperitoneal treatment of the stump. The ovaries, which

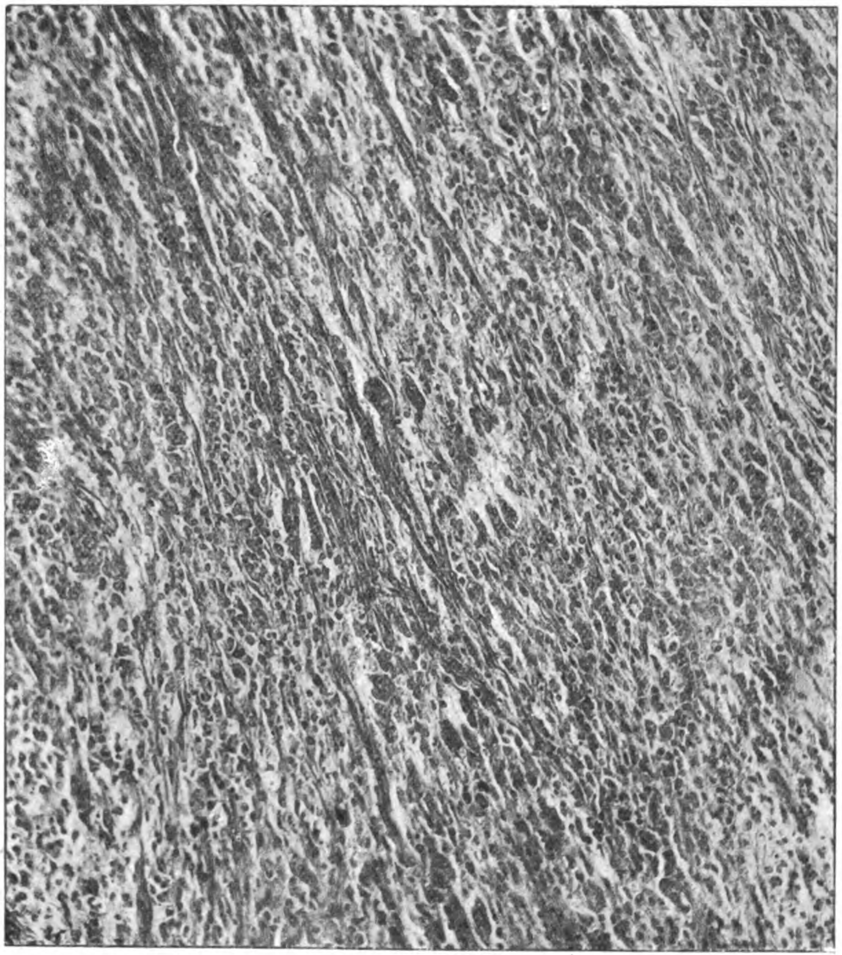

FIG. 2.

Photomicrograph of sarcoma of uterus (Case I) showing spindle cells and round cells. Some of the cells and nuclei are very large and stain deeply. In some sections the transformation of muscle-cells into sarcoma-cells can be seen.

appeared healthy, were left behind. The wound healed by first intention, and the patient left the hospital on April 22, 1896. At the operation and for some weeks afterwards, while the tumour was being hardened, no suspicion of malignancy arose. Recurrence took place in the lungs (diagnosed in 1897) and in the pelvis and hip (diagnosed in 1898), and the patient died on August 18, 1899.

The uterus removed weighed 5 lb. 15 oz., and measured 19 cm. by 19 cm. by 11·5 cm. The section (*see* fig. 1) showed that the whole of the body of the uterus was occupied by a tumour which extended nearly to the peritoneum. There was a distinct capsule to the tumour, well seen below. The upper part of the tumour, however, was continuous with the uterine wall. The lower part of the tumour was slightly granular and at the same time showed indications of a fibrous reticulum. The upper half of the tumour was of waxy homogeneous appearance. The peritoneum was smooth and showed no growth. The uterus had been divided just above the internal os, exposing the uterine mucosa, which was smooth and bulged slightly, as it would from the presence of a submucous fibromyoma.

Microscopic Structure.—The tumour is a mixed-cell sarcoma, evidently arising in a fibromyoma, for at the periphery of the tumour the general appearance is that of the fasciculated arrangement of a fibromyoma, the muscle cells of which are large, with an occasional very large cell. Towards the central part of the tumour the structure is that of a typical large round and spindle-cell sarcoma (*see* fig. 2).

Case II.—E. F., a virgin, aged 48, was sent to me by Sir Thomas Barlow, on March 12, 1899, complaining of distension of the abdomen for some years and excessive loss for ten months. Menstruation, usually lasting for a week, had been profuse, of three weeks' duration, for the last six months, but was attended with little pain. At times there had been a slight discharge, not hæmorrhagic. The patient was thin and had a sallow complexion, but her friends had not noticed any change in these respects, nor had the patient noticed any increase in the abdomen of late. She was quite free from pain and, except for the sallow complexion, she seemed in good health. In the abdomen was a softish tumour, of elongated oval shape, which reached up for 5½ in. above the pubes, 1 in. above the umbilicus. It was regular in outline and was diagnosed as a myoma. No souffle could be heard over the tumour. The cervix was healthy. There was no sign of fluctuation. On June 12, 1899, I saw her again. She had been taking ergot, which at first diminished the loss, but the last period was again profuse. She was not thinner and the legs were not swollen. As she seemed to be suffering from toxæmia, due to what was supposed to be a degenerated myoma, I advised removal of the uterus by abdominal section. Two days before the operation I found slight pleuritic effusion on the right side. Sir Thomas Barlow did not think this would interfere with the operation, and accordingly I amputated the uterus by the supravaginal operation with subperitoneal treatment of the cervical stump, on

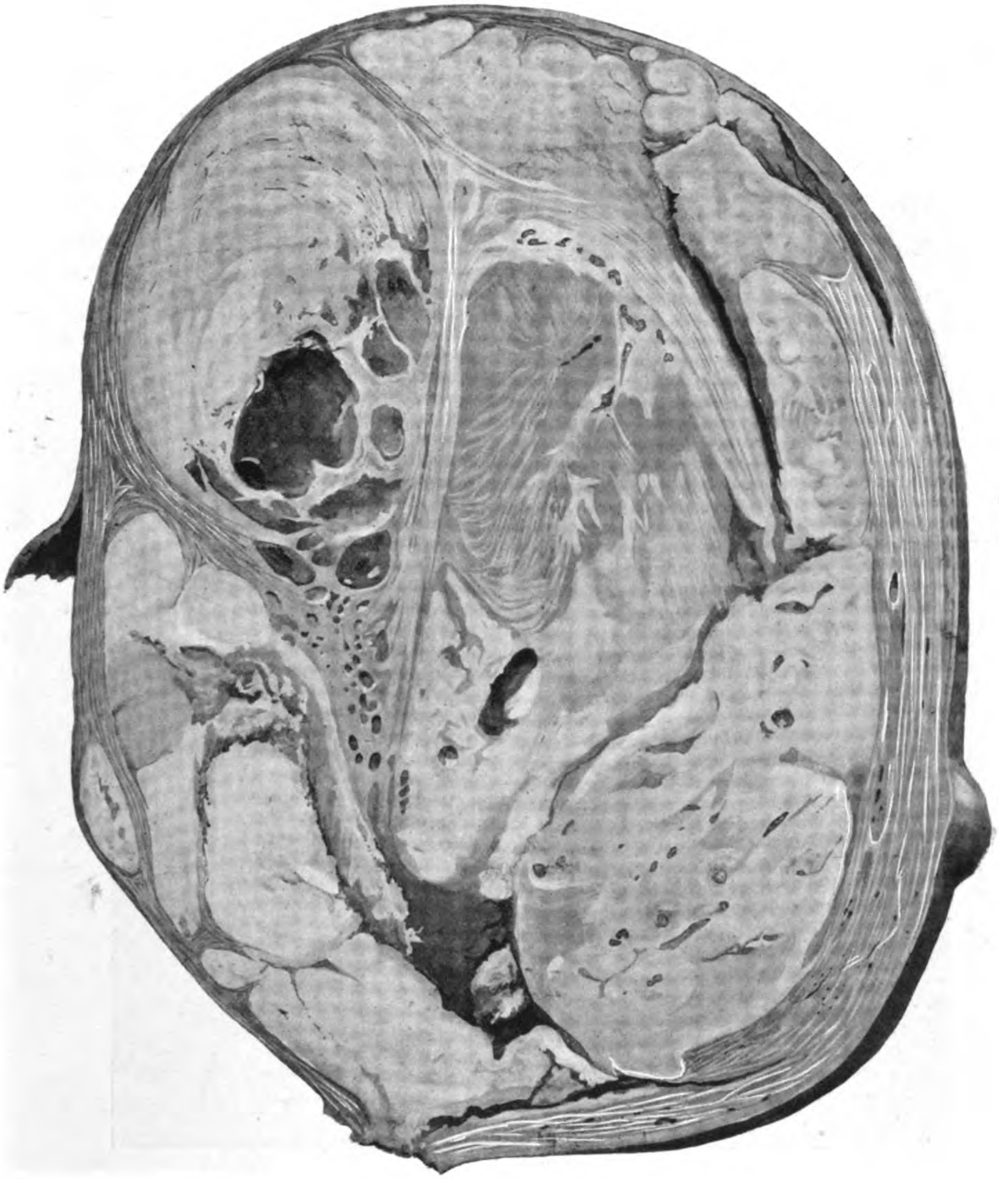

FIG. 3.

Sarcoma of the uterus (Case II), natural size. The uterus has been amputated through the unaffected cervix. During the process of hardening, part of the soft growth has been extruded into the os; but the cut surface of the cervix was quite normal in appearance in the fresh state. The tumour (which, unopened, resembled a myoma, and contains a small, subperitoneal myoma of normal structure on its posterior wall) is seen, on section, to contain masses of sarcoma separated by fibromuscular septa.

July 13, 1899. The patient made a good recovery and left the nursing home in a month apparently well, but still having a little effusion at the right base. Some months later a large amount of blood-stained fluid was removed from this side by Mr. Bilton Pollard, and it was evident that there was malignant disease of the pleura and lung. In February, 1900, the patient was found to be very ill with growth in the lung, liver, vagina and vulva, from which she died in the course of the year. At the operation and up to the time of her leaving the home, no suspicion had arisen that the tumour was malignant. It was

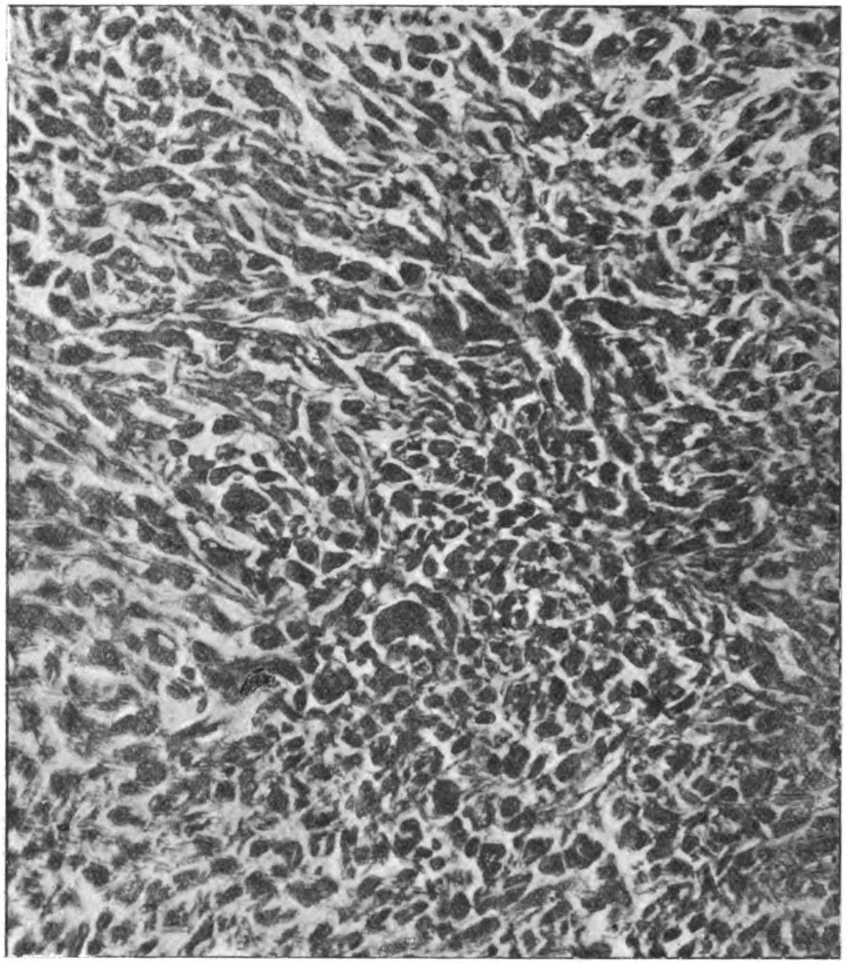

FIG. 4.

Photomicrograph of sarcoma of uterus (Case II) showing large spindle cells and large round cells, with large and deeply staining nuclei. In other sections the transformation of muscle-cells into sarcoma-cells can be seen.

kept to harden, and when the bloody fluid was obtained from the pleura the tumour was examined and found to be a sarcoma.

The uterus weighed 3 lb. 12 oz., and measured 15 cm. by 14 cm. by 11 cm. The peritoneum was smooth. The uterus had been amputated at the lower segment, exposing the lower end of a submucous and intramural tumour which occupied the whole of the body. On section (*see* fig. 3) the tumour was surrounded by the uterine wall which varied from 2 mm. to 1 cm. in thickness. The margin was a little irregular, particularly above, where at one spot it had penetrated nearly to the peritoneum. The tumour was divided up by fibrous strands like those met with in a fibromyoma. The central part of the tumour had a somewhat hyaline appearance; the rest was rather granular and in it smooth-walled cysts and numerous orifices of vessels were seen. On the surface of the posterior wall was a subperitoneal tumour having the usual appearance, and showing microscopically the structure of a fibromyoma.

Microscopic Structure of the Main Tumour.—A section was made through a fibroid strand in the tumour and the surrounding growth. The fibroid part shows fibromyomatous tissue, some parts of which do not differ very much from ordinary fibromyoma; but other parts show the muscle cells and their nuclei increased in size and less fasciculated in arrangement. Scattered among the muscle-fibres are small round cells. On the edge of the non-fibroid portion of the growth the cells become very large, some being giant cells and having an irregular arrangement, some are round and a few leucocytes are seen scattered through the tissue (*see* fig. 4). It is a mixed-cell sarcoma arising from the transformation of the cells of a fibromyoma. The secondary growth in the vagina was of similar structure, but the cells were mostly spindle-shaped.

(*March* 1, 1917.)

Four Cases of Undiagnosed Cancer of the Cervix in 200 Total Hysterectomies for Myoma.

By HERBERT R. SPENCER, M.D.

AMONGST 200[1] total abdominal hysterectomies which I have performed for myoma I have met with four cases of undiagnosed carcinoma of the cervix, without taking into account a number of cases in which hysterectomies for carcinoma of the cervix were complicated with myoma. In two of the four cases the carcinoma was unsuspected before operation; in two it was suspected on account of the bleeding on examination, but was not diagnosed owing, in one case, to the os being out of reach (large pelvic subperitoneal cervical myoma), and, in the other case, to the portio being uninvolved and the cervix so large that it was thought possibly to contain a myoma. The results of these four operations are as follows:—

The first patient, who suffered from heart disease, died suddenly within a year of the operation of syncope when going up stairs. As the cancer was in a very early stage there can be little doubt that, had she survived, she would have remained free from recurrence.

The second case remains free from recurrence after six years.

The third case remained well for five years, when a recurrence was detected of which the patient died six years all but three weeks after the hysterectomy.

The fourth case, in which the cancer was very extensive, has already a recurrence.

I submit these four cases to the consideration of those gynæcologists who still continue to amputate the uterus for myoma, leaving the cervix, instead of performing total abdominal hysterectomy, an operation which in my opinion is in every important respect (except that it takes a few minutes longer to perform) superior to the supravaginal operation, and which accordingly I have performed in every case of abdominal hysterectomy for myoma and have persistently advocated during the last sixteen years.

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[1] Within one or two on either side, the exact figure being as yet impossible to give owing to the difficulty of deciding whether one or two cases complicated with other tumours should be called hysterectomy for *myoma*.

Its value in removing cancer unrecognized at the time of operation is illustrated in these cases in which cancer of the cervix was found present in no less than 2 per cent. Its value in preventing the subsequent development of cancer in the cervix left behind is shown by the large number of cases already reported in which cancer developed in the cervix which was apparently healthy and in some cases certainly healthy at the time of operation. I have seen one such case in a hopeless condition from cancer of the cervical stump and surrounding parts six years after a supravaginal amputation by a surgeon for myoma: the patient had been free from hæmorrhage and discharge for more than three years after the operation.

In making this small contribution to the subject of hysterectomy I appeal to those who prefer total hysterectomy—a small but increasing number—to examine the cervix in all cases macroscopically and, if suspicious, microscopically, with the object of obtaining facts bearing out this important question and of increasing our knowledge of early carcinoma of the cervix; and I appeal to the advocates of amputation to publish all the cases known to them of cancer of the cervical stump at or following the amputation, and not to bemuse themselves with supposed disadvantages of total hysterectomy which do not exist, nor with the supposed rarity of cancer of the stump, while refraining from producing the only evidence on their side of the question which is of equal value—viz., the after-history of a consecutive series of one or two hundred cases of amputation for myoma of which every case has been followed up *and examined* five years after the operation.

Case I.—M. C., aged 44 (who had had no child but five miscarriages, the last thirteen years ago), was admitted to University College Hospital on October 14, 1905, complaining of a tumour, great abdominal pain, and almost constant losses of blood during the last seven months, the longest period of freedom from bleeding being one week. The tumour had been noticed for more than a year and was increasing. Menstruation began at the age of 14, was regular till this illness, lasted four to five days, and was attended by pain in the back during, and for three or four days after, the flow. A watery discharge had been present for eleven months. Micturition was painful and frequent (four or five times at night); the bowels were confined. On admission the patient was fat, anæmic and cyanosed, the pulse 120, intermittent; respiration 44. There was a feeling of faintness; the heart was dilated, the first sound was blurred and a systolic murmur was sometimes audible at the apex. The temperature was slightly raised (up to 101·8° F.), and only fell to normal on two occasions while the patient was in the hospital. The girth of the abdomen was 44 in. at the level of 4 in. below the umbilicus, and the abdomen was distended by an enormous globular tumour reaching up to 11 in. above the pubes. The portio was healthy, the os small and round. The tumour was diagnosed as a degenerated myoma. No bleeding followed the examination. For several weeks the patient had to be propped up in bed on account of the condition of the heart. My colleague, Dr. Sidney Martin, kindly saw her and prescribed digitalis and nux vomica. Her general condition improved a good deal, so that, although she was still cyanosed and the pulse slightly intermittent, it was possible on December 1, 1905, to perform total abdominal hysterectomy by Doyen's method. The wound healed by first intention and the patient left the hospital, having lost the cyanotic appearance and in good general condition, on January 6, 1906. She continued to improve and remained well for some months with occasional attacks of syncope, from one of which she died suddenly when going upstairs within twelve months of the operation.

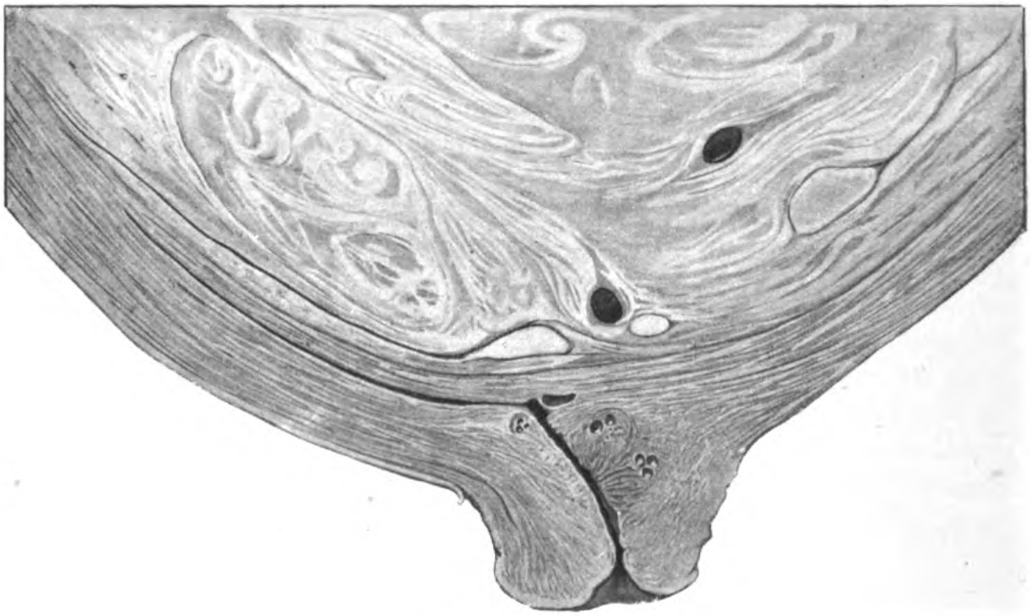

FIG. 1. (Case I.)

The cervix and part of the body of the uterus (which was over 10 in. in diameter, and weighed 10½ lb.) with intramural myoma. Two thrombosed vessels are seen in the myoma. In the upper half of the anterior wall of the cervix is seen a small growth striated towards the canal (papillary) with a few minute cystic spaces below it (dilated glands). This growth is a squamous-cell carcinoma. The portio is short, smooth, and perfectly healthy. The stratified epithelium extends up the canal as far as the growth (*see* fig. 2).

The uterus weighed in the fresh state 10½ lb. (preserved, 9 lb. 10 oz.), and

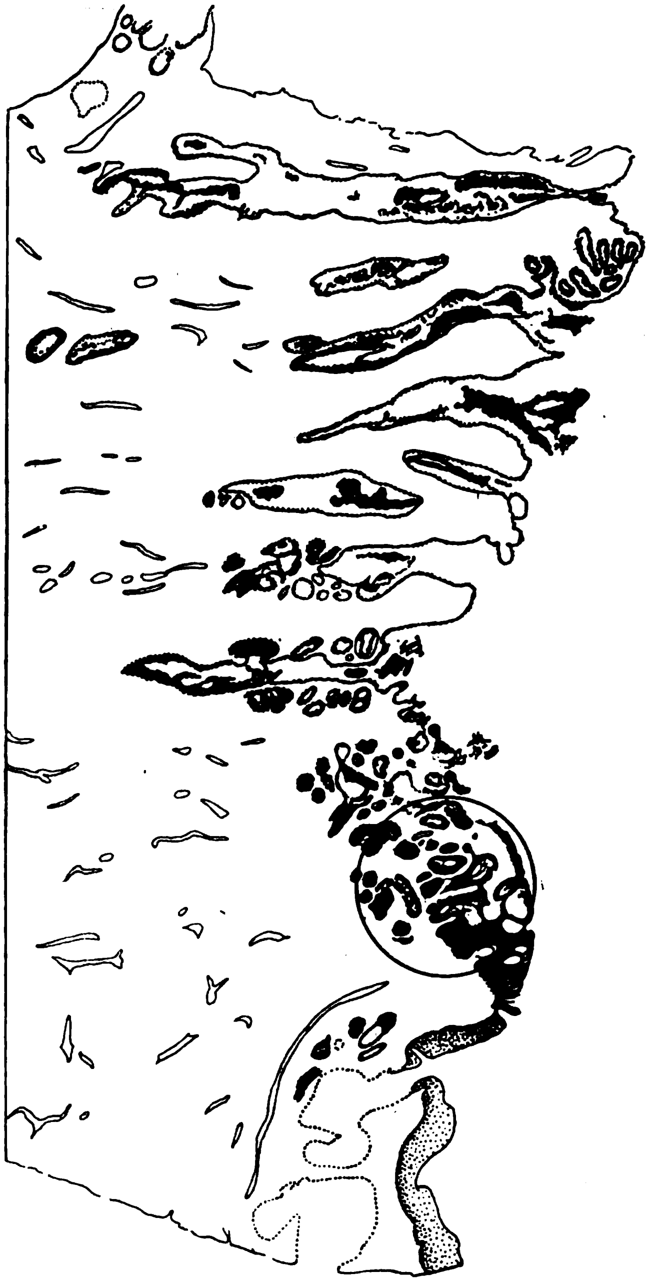

FIG. 2. (Case I.)

Camera lucida tracing of microscopic section of the papillary growth in cervix (low power). The black areas show squamous epithelium proliferated, and in some places desquamated, on the papillary processes, and invading the cervical tissues—squamous-cell carcinoma. The part within the circle is drawn under high power in fig. 3. At the bottom of the section is seen a strip of healthy stratified epithelium situated near the middle of the cervical canal.

formed a globular mass 10 in. in diameter (22·5 cm. by 23 cm. by 21 cm.) with two subperitoneal tumours on the top, one as large as a walnut, the other of the size of a filbert. The uterus was enlarged by a single intramural tumour growing in the anterior wall, measuring 19 cm. by 13 cm. on section, which had raised the peritoneum anteriorly for a height of 10 to 15 cm. above the external os. The tumour was slightly degenerated towards the periphery at one spot and contained in the middle of the lower half three large vessels filled with clot, the largest of which measured 2·5 cm. by 0·5 cm. The portio vaginalis was healthy, the os round. The cervix was 3 cm. long. The canal

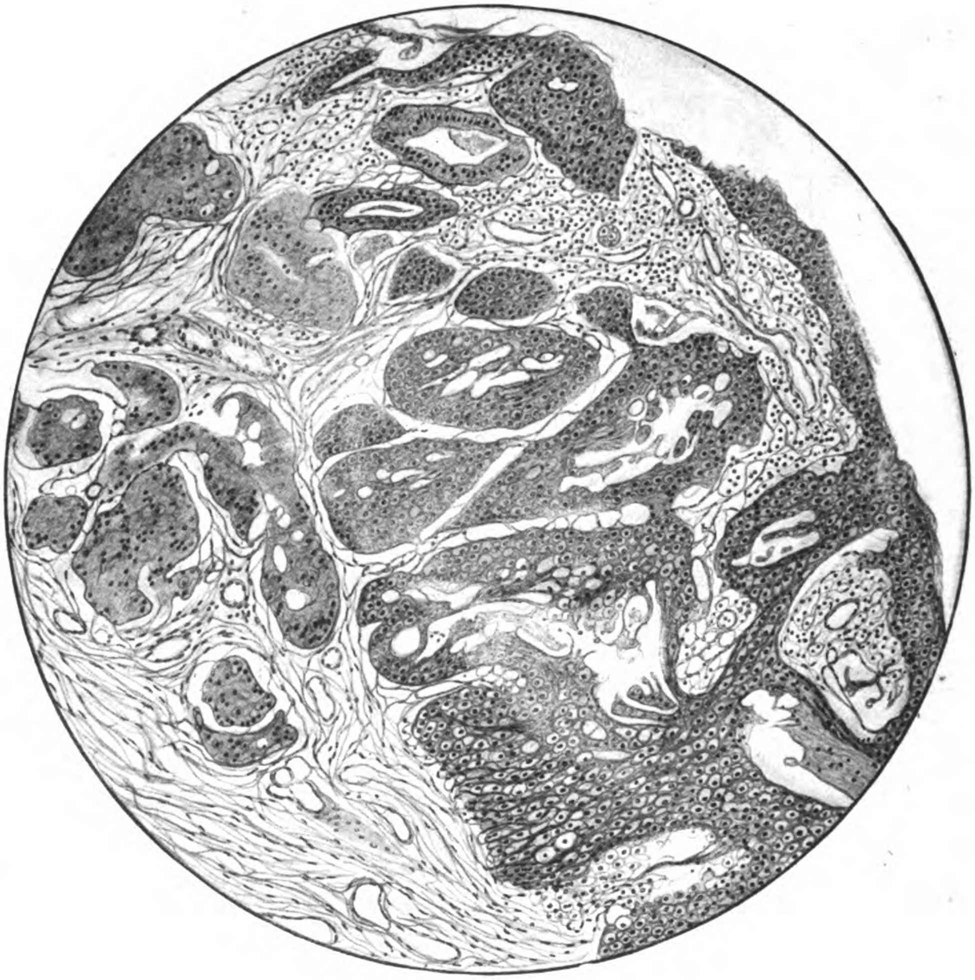

FIG. 3. (Case I.)

A microscopic section (high power) of the part within the circle in fig. 2, showing squamous-cell carcinoma and round-cell infiltration.

of the body was, in the sagittal section, 8 cm. long, its mucosa extremely atrophied, being only visible in the upper ½ in., and there not more than 0·5 mm. in thickness. The mucosa of the cervix was normal in the posterior wall, but was curiously striated and cystic on the anterior wall at its upper part, where it was 7 mm. thick (*see* fig. 1). This striated portion is a squamous-cell carcinoma. Below it the wall is lined with healthy stratified epithelium.

Microscopic Structure.—The mucosa of the body showed a single layer of flattened epithelium and no glands. The affected portion of the cervical mucosa showed stratified epithelium and cysts lined with columnar epithelium beneath it. The stratified epithelium goes down into the tissues and forms masses of squamous cells (typical squamous-cell carcinoma) from the centre of which the epithelium has fallen out (*see* fig. 3). The epithelium of some of the glands is also proliferated, forming large masses of epithelial cells. The papillary projections causing the striated appearance are very vascular and are covered with several or many layers of squamous epithelium which has desquamated in places (fig. 2).

This occurrence of a squamous-cell carcinoma high up in the cervical canal with outgrowth of proliferated squamous metaplastic epithelium on papillary processes and ingrowth into the tissues perhaps explains why some cases of carcinoma in the substance of the cervix have the appearance of squamous-cell carcinoma, although from the mode of growth we should expect them to be columnar-celled; of these, Case 4 is an example.

Case II.—Mrs. R., aged 43 (children three, abortions eight), was seen by me on October 31, 1910. Her last pregnancy occurred seven years ago, and she had suffered from dysmenorrhœa for eighteen months and from menorrhagia. Menstruation began at the age of 11 (the patient was born in Ceylon) and till lately was regular and lasted four days. There was no discharge and no bleeding between the periods or on coitus. The dysmenorrhœa was very severe and the patient sometimes woke up with a pain in the back, which passed through to the front, and was relieved by walking about. On examination the patient was in good general health. The uterus reached up for 3½ in. above the pubes. The cervix admitted the finger for ¾ in. and felt quite smooth and healthy. The uterus was enlarged by a myoma to the size of a uterus at three and a half months of pregnancy, and was fairly movable. The myoma appeared to be single and probably submucous. I proposed to remove it by enucleation through the cervix; but the patient and her husband, who was a doctor, did not want to run the risk of a recurrence. I therefore removed the uterus by total abdominal hysterectomy on November 4, 1910. The patient made a simple recovery and remains well in January, 1917.

The uterus measured 14 cm. by 9 cm. by 9 cm. and weighed 1 lb. 3½ oz. It contained a single myoma in the anterior wall of the size of a flattened

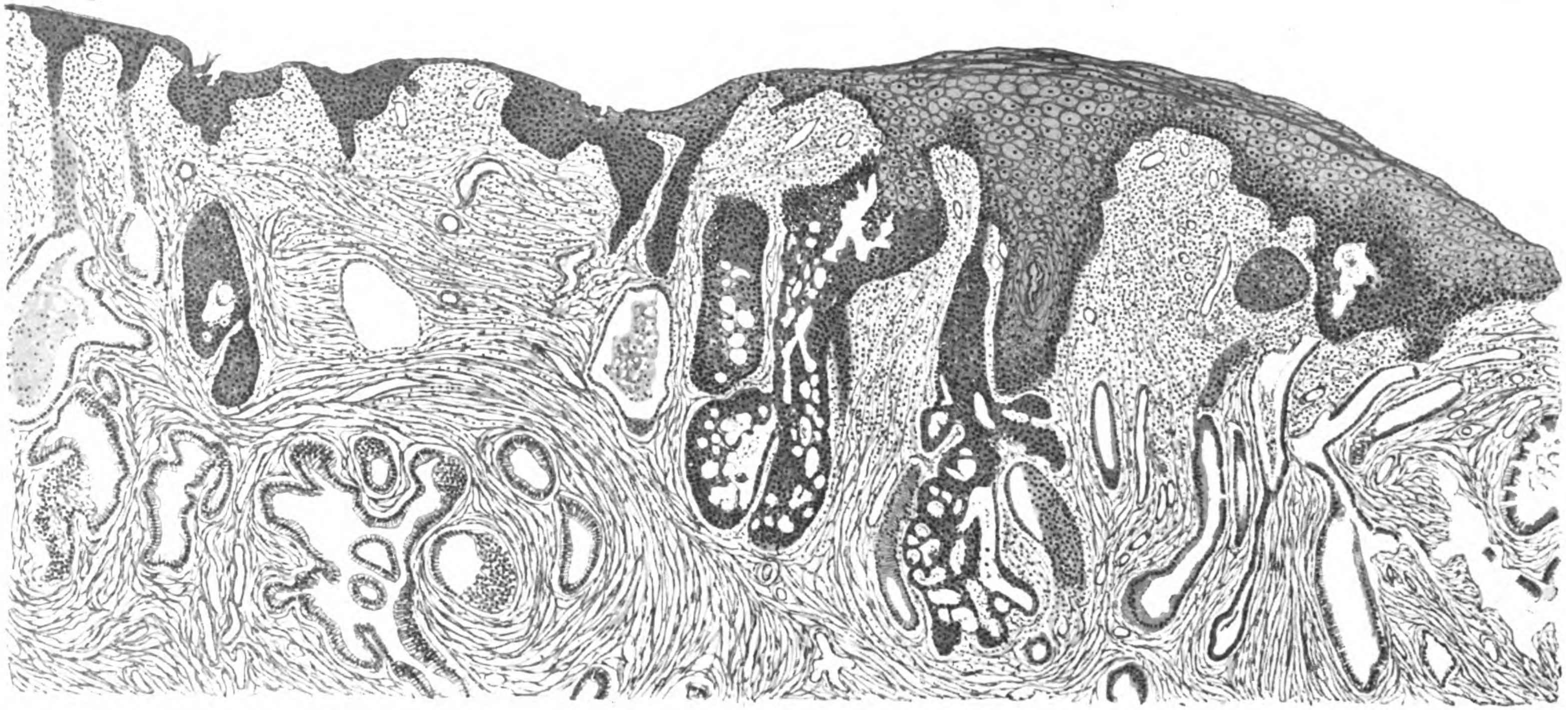

FIG. 4 (Case II).

Vertical section (low power) of raw area on portio in Case II, slightly reduced from drawing through *camera lucida* by Mr. Ford. The external os is just to right of figure. There is some glandular hyperplasia. The section shows a fairly even, slightly wavy surface. The superficial squamous cells have desquamated on the left. The deeper epithelium is dark in colour, and in several places is penetrating into the substance of the cervix. There is abundant round-cell infiltration. Several considerable masses of epithelial downgrowth are seen, showing vacuoles where the cells have fallen out. In one or two places the epithelial growth shows a tendency to invade the glands. The cells of the epithelium contrast distinctly with the normal epithelium (not seen in section). They are darker, and, under a high power, the nuclei are seen to contain more chromatin, the basal cells have entirely lost their regular shape and side-to-side arrangement, and the deepest cells and nuclei become elongated and radiate from the extremities of the columns diffusely into the tissues. This is the earliest stage of carcinoma of the cervix I have seen. The section exactly resembles, even to the invasion of the glands, one taken of the growing edge at the external os of the advanced growth in Case IV.

orange. The tumour was a good deal degenerated, being quite gelatinous at the periphery, but nowhere cystic. On the anterior lip of the portio (which was very short) there was a small raw red area not much bigger than a pea, slightly uneven, like a small erosion. As a matter of routine I had this cut for the microscope, though not suspecting cancer.

Microscopic Structure.—The raw area shows the early stage of a typical squamous-cell carcinoma with marked round-cell infiltration (*see* fig. 4).

Case III.—A. R., aged 44 (children three, one born dead), was admitted to University College Hospital on January 16, 1911, complaining of headaches for a month and of an abdominal tumour which had been noticed for two years. She had had coitus up to the time of admission, but this had never been followed by bleeding. The headache was attributed to a blow on the left frontal region six years ago, which caused temporary paralysis (and permanent weakness) of the right side, for which she was in the Hospital for Paralysis for fourteen weeks. The tumour caused no trouble but was getting larger. Menstruation began at the age of 15: at first was very irregular and lasted only two days; but after the birth of the first child, at the age of 24, it had been more regular, lasting five days and requiring twelve diapers. The patient had not menstruated for two years. Micturition had been frequent for the last year. On admission the patient's face was rather congested, the bridge of the nose sunk, the nails rather blue, the breasts flaccid. A tumour could be felt rising up for 8 in. above the pubes: it was situated almost entirely on the right side, and was fixed by the broad ligament. No souffle was heard over the tumour. The perineum was slightly torn, the cervix was in the middle of the pelvis, very far back, and bleeding on examination. Only the edge of the cervix could be touched, on account of the presence of a large fibroid behind and incorporated with it, which was part of the tumour felt in the abdomen. The diagnosis was myoma of the uterus with (possibly) cancer of the cervix, which was suspected on account of the hæmorrhage on examination, the os itself being out of reach. Total abdominal hysterectomy was performed on January 21, 1911. The tumour had invaded the right broad ligament extensively, and had to be enucleated before the uterus could be drawn up. Douglas's pouch was then opened and the cervix seized. It was brittle and appeared to be carcinomatous. The vagina was circumcised with scissors, but as the cut appeared to pass through growth, a further piece of vagina and of cellular tissue of the right broad ligament was removed with the cautery, which was also applied to the raw surface of the broad ligament. The peritoneum was closed by a purse-string suture and the abdominal wound was closed by silkworm gut through-and-through stitches and buried silk. The operation lasted ninety-one minutes. The patient was a good deal shocked. Two pints of saline fluid were injected intravenously. The wound healed by first intention. The patient made a good recovery, and remained well for over five years. She was in the hospital in January, 1906, for a broken tibia and fibula, caused by tripping over a mat. She felt quite well, but I took the

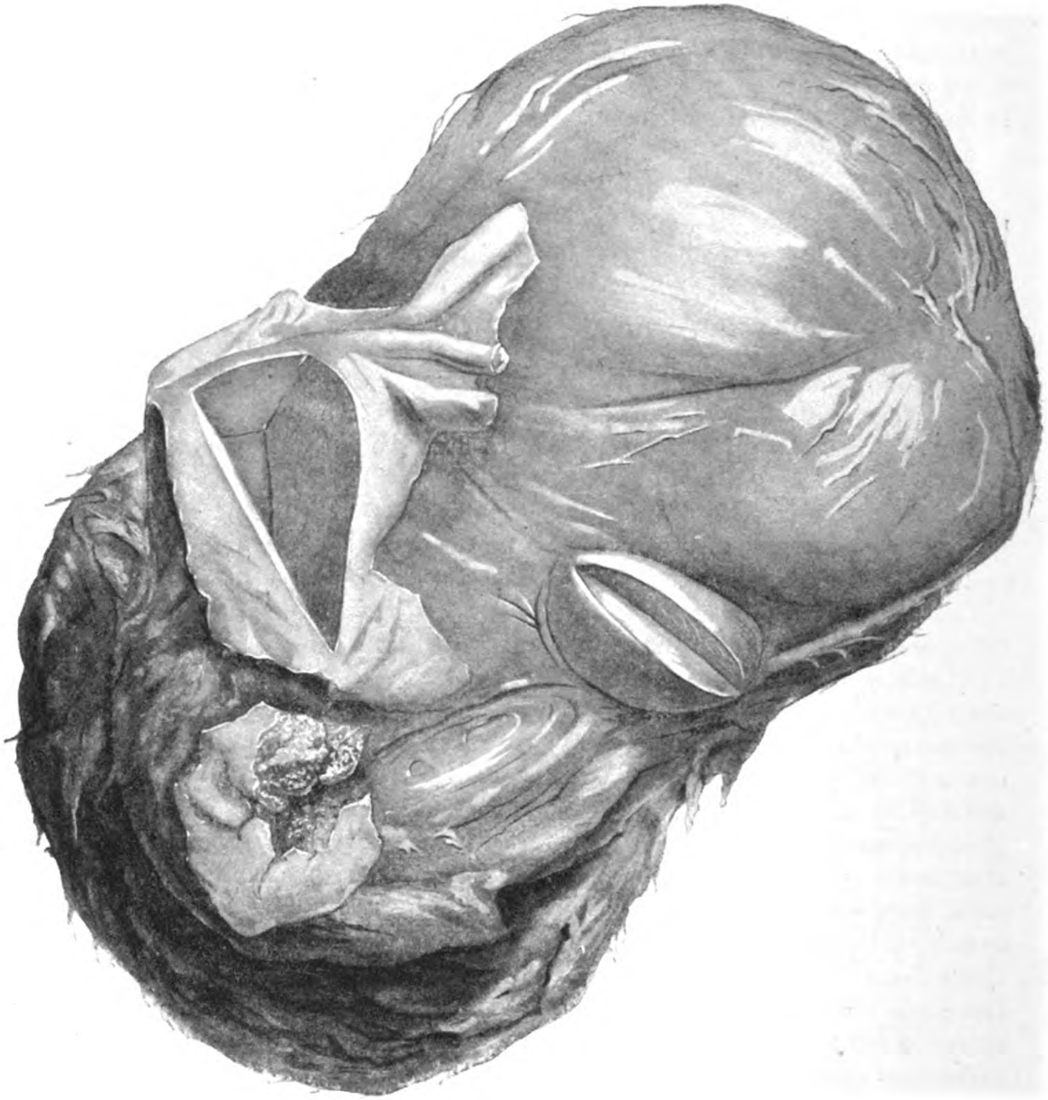

FIG. 5. (Case III.)

Uterus and cervical myoma, weighing 6 lb., seen from behind. The uterine body is free from growth. Part of the right appendages and the cut peritoneum are seen around it. The whole tumour is bare, enucleated from the right broad ligament. The lower pole blocked the pelvis, rendering the os inaccessible; it was enucleated from the cervical wall through the crescentic incision below. The portio has been opened posteriorly and shows cancer (squamous-cell carcinoma). ($\frac{2}{3}$ natural size.)

opportunity of examining her; she had some pain in the thighs and some thickening could be felt on vaginal examination. On February 22, 1906, this thickening was a well marked growth in the cellular tissue as big as a small apple. The tumour gradually enlarged and cachexia developed, and the patient died of recurrence on December 29, 1916, six years (all but three weeks) after the operation.

Description of Specimen.—A uterus with large cervical myoma and carcinoma of the cervix. The uterus measures 26 cm. by 15 cm. by 17 cm. and weighs 6 lb. The body of the uterus is not altered and its mucosa is normal. The appendages are missing, except part of the right tube; they were normal in appearance. The cervix is the seat of an intramural and subperitoneal myoma of irregular shape which has been enucleated from beneath the peritoneum and in front also from the cervix through an incision into its anterior wall. The muscular capsule has retracted towards the region of the external os, where it exists as a roll of tissue 3 cm. thick by 11 cm. across. On this is seen the external os cut open by an incision in its posterior wall, which is the seat of a friable carcinomatous growth extending nearly through the lip. The anterior lip is but little affected with cancer except on the right side. The external os is irregular (*see* fig. 5).

Microscopic Structure.—The large tumour is a myoma and the growth in the cervix is a squamous-cell carcinoma.

Case IV.—A. B., aged 44 (children three, abortions two), was admitted to University College Hospital on December 14, 1915. The last labour, fourteen years ago, was difficult, instruments being used and the patient has been tender ever since. She complained of flooding, which occurred three months ago at the time of the periods and was followed by pain in the knees and legs. Menstruation began at the age of 12, was regular every twenty-eight days, except at the age of 17 (when it stopped for a time) and was scanty, lasting three days. There had been a yellowish-white offensive discharge between the periods for two years. On admission the patient was rather thin and pale. A tumour could be felt reaching up to 5½ in. above the pubes; it felt like a degenerated fibroid. On vaginal examination the patient bled freely. The cervix was very hard and enormously enlarged. The diagnosis was multiple myomata of the uterus and (possibly) cancer of the cervix. The suspicion of cancer was due to the hæmorrhage which followed examination, for the portio was smooth and greatly enlarged and, although the os was slightly open, considerable pressure did not show any brittleness at the external os. On December 18, 1915, the uterus and appendages were removed by total abdominal hysterectomy. In doing this a clip was put on the right ureter, mistaken for a vessel; the error was at once discovered and the forceps removed, but the pressure caused a leakage subsequently. The convalescence of the patient was interrupted by a little suppuration at the upper part of the wound and by leakage of urine *per vaginam.* By January 10 the wound had healed. There was a ureteral fistula at the top of the vagina when the patient left the hospital on January 22, 1916. Later on there was clear evidence of recurrence in the pelvic cellular tissue.

Description of the Specimen (*see* fig. 6).—The uterus measures 14 cm. by 10 cm. by 8·5 cm. The body contains an intramural myoma 6·5 cm. by 5·2 cm. on section. The cervix is enormously distended (7 cm. by 6 cm.) and contains a carcinoma reaching up for 5·5 cm. above the external os but surrounded everywhere by at least 1 or 2 mm. of muscular tissue and at the portio by 3 mm. or more of unaffected tissue. The external os has a papillary erosion which does not appear to be cancerous. The right ovary is converted into a multilocular cyst, measuring 11 cm. by 8·5 cm. by 6·5 cm., from the inner surface of which depend a few pedunculated papillomata. One small papillomatous mass is attached to the outer surface. Both tubes are distended (hydrosalpinx). The left ovary appears to be somewhat fibrotic and is slightly enlarged and adherent to the tube.

Microscopic Structure.—The cervical growth is a carcinoma presenting the appearance of squamous carcinoma, with keratinization and round cell infiltration. The "erosion" on the cervix shows that the carcinoma has just reached the external os at that spot. The squamous epithelium at the edge of the os grows down into the tissues and shows that the growth is a true squamous-cell carcinoma. The warty growths in the ovarian cyst are simple papillomata.

DISCUSSION.

The PRESIDENT: The question whether total hysterectomy or subtotal hysterectomy is the best operation for the removal of fibromyomata of the uterus is one of great importance. With sarcomatous degeneration of such a tumour, however, the question is not so important as it is when a carcinoma develops in a fibroid uterus. As the specimen I have demonstrated this evening shows, the patient may remain free from recurrence, even when the body of the uterus has been removed and the cervix left, in the case of a sarcoma mistaken for a myoma. So far as I know the cases recorded in the literature show that the chances of recurrence are equally great whether the cervix is retained or not. I should like to know if the recurrence involved the cervix in the two cases recorded by Dr. Spencer. The possibility of the presence at the time of the operation, or the subsequent occurrence, of a carcinoma of the cervix, is a very important matter when subtotal hysterectomy is practised. With regard to the four cases of carcinoma brought forward by Dr. Spencer I think that two at any rate should not have been included, as the presence of the carcinoma was strongly suspected, although it was not proved, before operation, and I imagine that even the most ardent advocate of subtotal hysterectomy certainly would have performed a total hysterectomy in these cases. Personally I should never practise the partial operation in any case with a blood-stained discharge present between the periods. Cullen, in an examination of 1,674 cases of fibromyomata of the uterus, has found eighteen cases of carcinoma or a frequency of a little over 1 per cent. If that is the average frequency, and I think it may be assumed it is, I consider that if total hysterectomy be practised by large numbers of operators the increased risk of the operation will exceed that of patients dying subsequently of cancer in the stump of the cervix, even assuming that all such cases end fatally, which is unlikely. I am of opinion that no hard and fast rule can be laid down, and I shall continue to practise subtotal hysterectomy in patients in whom the cervix is quite healthy at the time of the operation and the case an uncomplicated one of fibromyoma of the uterus, but in any complicated or doubtful case I should not hesitate to resort to total hysterectomy.

Dr. H. RUSSELL ANDREWS: Dr. Spencer has not made out a strong case for panhysterectomy for fibroids. Can he bring forward any evidence to show that sarcoma is likely to recur in the cervix after subtotal hysterectomy? Two of Dr. Spencer's four cases of carcinoma are hardly worth inclusion, as in one the cervix could not be felt and in the other Dr. Spencer had been suspicious of the cervix. At one time I performed panhysterectomy as a routine operation for fibroids, but for the last ten years I have removed the whole cervix only in cases in which laceration and eversion of the cervix have made it probable that there would be persistent discharge if the whole cervix was not removed. My practice is to scoop out most of the cervix, and in doing this I have only once found unexpected carcinoma, although I have removed many uteri which contained both fibroids and carcinoma. During the last eight years 761 hysterectomies for fibroids, chiefly subtotal, have been performed at the London Hospital. The late Dr. Maxwell and myself were for many years on the look-out for carcinoma occurring in a cervix that had been left behind, but no such case has been seen at the London Hospital. I have seen very many patients who came to the London Hospital to seek advice for ailments, some gynæcological and some having no connexion with gynæcology, after subtotal hysterectomy for fibroids, but I have never seen carcinoma of the cervix among any of them. I cannot believe that carcinoma of the cervix is common among these patients, as it is inconceivable that patients who develop carcinoma should always go elsewhere for advice, while for advice on every other ailment so many return to the London Hospital.

Dr. EDEN: Dr. Spencer has not pursued his argument to its logical conclusion, for he thinks the cervix should be removed because it may at the time be the seat of undiscovered cancer, or, alternatively, that it may subsequently become cancerous. But two of Dr. Spencer's cases, although in a very early stage of the disease, died of recurrence, and it cannot be doubted that an extended hysterectomy (Wertheim) would have given them a better chance. To be consistent Dr. Spencer should advocate Wertheim's operation instead of panhysterectomy. Again, does Dr. Spencer conserve the ovaries in operating for fibroids? These organs also sometimes become the seat of primary cancer. It is very difficult to see at what points these precautionary measures should stop.

Mr. J. D. MALCOLM: I have for many years removed the whole uterus in operating for fibromyoma, because in two cases I attributed septic trouble to a spread of infection from the cervix uteri. Recently I have on two occasions left the cervix. In one case the removal would have been unusually difficult and the patient's condition was so serious that time was of importance. Death was due to gangrene of the cervix. I have seen one case in which there was an irremovable cancer of the cervix uteri and, as far as I could trust the evidence, the uterine body had been removed for fibromyoma.

Mr. T. G. STEVENS: My opinion is that Dr. Spencer's first two cases are not cases of cancer of the cervix at all. The appearances seen in the microscopic sections are those with which I am quite familiar in erosions of the cervix. They constitute a proliferation of the vaginal epithelium around the openings of glands and constantly occur in erosions. They are not of the nature of a carcinoma, and never give rise to a carcinoma.

Dr. LAPTHORN SMITH: Dr. Herbert Spencer has once again reminded us of the tendency of fibroid tumours to become infected with cancer. This is a point of vital importance, for there are still many people and a few doctors who tell women with fibroid uteri that there is no hurry about having them removed until they have attained a very great size. I have seen a great many tumours which the women have carried for many years, and they were told that it was a benign growth and that there was nothing to worry about. And yet some ten or fifteen years later those benign tumours had become malignant, and some of the women lost their lives in consequence. But in my experience, which is less extensive than Dr. Spencer's, I have not known a single case in which, after the removal of a fibroid of the uterus, the remaining inch or two of cervix has become infected. My own opinion is that when we have done a supravaginal removal of the tumour, and especially if we have done it early, we have permanently cured the patient, and that the risk of the cervix afterwards becoming malignant is very slight. Another reason why this is so is that the cancer cell does not grow on normal tissue very easily, but nearly always on scar or fibrous tissue. If the woman were a multipara and had a badly lacerated cervix healed not by sewing but by granulations, then she would run as great a risk of that lacerated cervix becoming infected as any other woman of her age. But, as we know, fibroid tumours are most common in childless women, the cervix is normal in structure, and therefore unsuitable for the cancer cell to be implanted into it. Such being the case, I have abandoned the longer and more difficult and dangerous operation of total extirpation, and now invariably leave the cervix from the internal os downwards. In a stout woman with the tumour low down in the pelvis even the most skilful operator has an arduous task to perform, which requires much time under anæsthesia. But there is another reason why the majority of the operators now leave the cervix, and that is on account of the troubles which are due to the shortening of the vagina. One would hardly think that taking out that cervix would make any difference at all, but we must remember that the cervix helps to form the roof of the vaginal pouch, and when you have taken it out and brought the sides together the vaginal space has been quite considerably abridged. At any rate, a great many operators of the highest standing have told me that they had had enough marital troubles related to them to induce them to leave the vagina at its full length. Finally, I might point out that we might warn the women to be inspected every six months or year, and on the slighest appearance of any symptom of malignancy to report to the doctor or some other operator, when it would be only a matter of a few minutes to remove it without difficulty or danger. On the other hand, all the cases of cancer of the upper part of the vagina which I have seen were recurrences after the very operation of total extirpation. The disease was implanted on the raw edge of the vaginal incision by operators who did not understand the frightful contagiousness of cancer, and took no extraordinary precautions to disinfect the cut edges. And the last state of these patients was worse than the first.

Dr. HERBERT SPENCER: The papers read to-night deal with two questions only, the frequency with which sarcoma is mistaken for myoma, and undiagnosed cancer occurring in operating for myoma, as points in determining the partial or complete operation. The President's case is an interesting one, especially in view of four years' freedom from recurrence; but, I ask, Is this the only case he has had of supravaginal amputation for sarcoma mistaken for myoma? He asks if my cases occurred in the cervix. I do not know. In one the vagina was full of growth which probably affected the cervix: in the other there were numerous metastases, some in the pelvis, but, as no post-mortem examination was made, I am unable to say with certainty whether the cervix was involved in these cases. But I am astonished to hear the statement that uterine sarcoma does not recur in the cervix, of which there are (comparatively) numerous instances on record, one of which is illustrated by a most striking drawing, and another described in Kelly and Cullen's book on myoma, which the President quotes with deserved approval. Large figures do not carry weight unless they are based on thorough examination. Kelly and Cullen's 1,400 cases of myoma were admittedly not thoroughly examined in the early years. They give seventeen cases of undoubted sarcoma and seventeen suspicious cases. But they say "without doubt some cases have been overlooked." "During the last decade . . . . careful pathologic records have been kept. We feel confident that as a result of these careful studies . . . . in the next few years this malignant change will be found to be relatively common." Dr. Russell Andrews expects his patients to come back to him when they get recurrence; that is generally the last thing a patient would think of doing when she has been promised a cure of her bleeding by supravaginal hysterectomy. Dr. Andrews asks why he does not see other gynæcologists' cases of recurrence in the stump. I can only tell him why he does not see mine. It is all a question of frequency: no one can deny that it occurs after the partial operation. I am sorry to hear that Dr. Fairbairn has given up doing total hysterectomy, although he recognizes its advantages. It will, of course, not always cure a case of myoma complicated with cancer; the important question is, Which is the better operation for such a case? Dr. Eden says the total operation involves more risk. I am of opinion that it involves less risk, and have published evidence in favour of my statement and will publish even more convincing evidence, but that is not the subject of these papers. Mr. Stevens says that the first case was an erosion. Who ever saw an erosion high up in the cervical canal, the lower part being healthy? Dr. Lapthorn Smith says the total operation shortens the vagina; it cannot shorten it by more than ½ in., and if the cervix is large it may even lengthen it. But of what importance is this? Again I ask for a record of 100 or 200 cases of supravaginal amputation for myoma in which every case has been followed up and examined after five years. After more than sixteen years' experience of the total operation I am able to say that the results, both immediate and remote, are good.

REPORT OF THE PATHOLOGY COMMITTEE.

(*March* 21, 1917.)

(1) Dr. Roberts's specimen of "Tumour of the Cervix undergoing Curious Degeneration": "We have examined this specimen and the sections. We are of opinion that it is a round-celled sarcoma in which hæmorrhage and necrosis have occurred to a marked degree. Histologically the cells have an arrangement around vessels, probably meaning that these are the only parts fairly well nourished."

(2) Dr. Herbert Spencer's specimen of "Carcino-sarcoma Uteri": "We have examined this specimen and the sections. We are of opinion that the uterus contained two growths, one having the structure of a columnar-celled carcinoma, the other that of a spindle-celled sarcoma, and that in places these growths appear to mingle. On these grounds we consider that the term carcino-sarcoma is justified."

(3) Mr. J. P. Hedley's specimen: "We have examined this specimen and the sections. We are of opinion that the uterus contains two distinct growths, one of which is a columnar-celled carcinoma; the other has the appearance of a spindle-celled sarcoma."

Section of Obstetrics and Gynæcology.

President—Dr. G. F. BLACKER.

(*May* 3, 1917.)

Case of Spontaneous Rupture of the Uterus.

By GORDON LEY, F.R.C.S.

THE specimen shown was removed, post mortem, from the body of a multiparous woman aged 46. She was admitted to the City of London Lying-in Hospital on February 10, 1917, under the care of Dr. Eardley Holland. The present pregnancy was her twelfth. She had had nine full-term labours, one instrumental, the last being in 1913, and two miscarriages, the last in 1914. She was full term. The pregnancy had been normal to the thirty-fifth week, when she had a considerable hæmorrhage lasting for one day. Since that date slight losses had occurred at intervals of two or three days, till February 9, when another considerable loss occurred. There had been no pains.

The membranes had ruptured on February 8. She was seen by a midwife on February 10, and sent to the City of London Lying-in Hospital. I saw her at 11 a.m. on February 10. She was considerably anæmic. Her temperature was 97° F., her pulse-rate 80. The abdomen was pendulous. The baby was lying as a right occipito-anterior. The fœtal heart was heard. On vaginal examination, the cervix admitted three fingers, the canal being long. The head was firmly engaged. The edge of the placenta was felt posteriorly at a distance of 1 in. from the edge of the internal os. I considered that, with the aid of a tight binder, delivery would be completed without further loss. This treatment was therefore adopted. There were no pains till 9.15 p.m. on February 11, when, after a labour lasting for one and a quarter hours, the baby was born. There was no ante-partum loss, and the baby was alive. The third stage of labour was completed in twenty minutes without excessive loss. A troublesome cough caused inconvenience to the patient and nurse during this stage. Ten minutes after the completion of the third stage, the patient complained of sudden dyspnœa. She became restless and her breathing was difficult and laboured. The anæmia increased, the pulse became feeble and rapid, and she died in fifteen to twenty minutes. A tentative diagnosis of pulmonary embolism was made.

On performing a post-mortem examination the following condition was revealed. The peritoneal cavity was intact. There was extensive retroperitoneal hæmorrhage into the substance of the left broad ligament, extending upwards to the lower pole of the kidney, and stripping up the pelvic and descending colon. This hæmorrhage originated from a rent in the left wall of the lower uterine segment.

The uterus, bladder and broad ligaments were removed and examined. The uterus measures 27 cm. by 14·5 cm. by 3·8 cm. Attached to it is a vaginal cuff 5 cm. long. The tissues of the left broad ligament and the peritoneum covering the left broad ligament, as well as the peritoneum covering the left half of the lower uterine segment, are purple-red in colour, due to infiltration of the subperitoneal tissues by blood. On opening the uterus longitudinally along its right border, the placental site is seen on the posterior wall of the lower segment. It measures 12 cm. from side to side by 7 cm. vertically, the lower margin of the site reaching to within 2·2 cm. of the internal os. The demarcation between the cervical canal and the body of the uterus is clearly defined. The canal has a circumference of 14·2 cm., and a length of 6·3 cm. Its mucosa is very slightly bruised. The body of the uterus is lined by a soft-velvety, pinkish decidua. The wall of the upper uterine segment has a thickness of 2·2 cm., that of the lower uterine segment 1·8 cm. to 2 cm. There is no line of demarcation between the segments. In the left border of the uterus commencing in the cervical canal 2·3 cm. below the internal os, and terminating in the body 7·5 cm. from the fundus, is a tear 13 cm. long. The tear passes from below vertically upwards for a distance of 2·2 cm., then obliquely upwards and forwards, and finally again vertically upwards; it passes through the left margin of the placental site. Its depth varies, but in its central and deepest part it extends through the wall of the uterus into the tissues of the left broad ligament. Microscopical sections show an apparently normal puerperal uterus lined by a decidua.

The remaining organs show little worth noting.

There is vesicular emphysema of both lungs, and a fine portal fibrosis of the liver.

I have thought this case worth bringing before the notice of the Section, first, because of the rarity of spontaneous rupture in a previously normal uterus; secondly, because of the association in this case of rupture and placenta prævia. I have seen three other cases of spontaneous rupture, all of which occurred through a Cæsarian section scar. It might possibly be considered that erosion by villi would weaken the wall of the uterus in the region of the placental site, and therefore tend towards the occurrence of rupture, but in all sections of placental sites I have examined a thin layer of decidua has separated villi from muscle. I think, therefore, we must assume that the causative factor does not lie here. The actual cause of the rupture in this case cannot definitely be proved. In past ages it would have been confidently attributed to fatty degeneration, seen by the naked eye. This did not exist in this case. The other factors here present—age, parity, and anæmia from previous losses—may play some part as causative factors.

(*May* 3, 1917.)

Decidual Reaction in a Subperitoneal Fibromyoma of the Uterus.

By Gordon Ley, F.R.C.S.

The specimen here described was removed from a primigravida aged 35. She was admitted, at full term, on January 29, 1917, to the London Hospital under the care of Dr. Russell Andrews. She had had antepartum hæmorrhage a few weeks previously. She was also suffering from partially compensated aortic regurgitation and mitral stenosis. The head was above the brim, and could not be made to engage. She was in labour. Cæsarean section was decided on, and was performed by Dr. Russell Andrews under stovaine. A small subperitoneal fibroid was situated low down on the lower uterine segment, posteriorly. It was removed by myomectomy. The tumour was date-shaped, and lay with its long axis parallel to that of the uterus. It was indefinitely encapsulated. Mother and baby did well.

The tumour was hardened in 4 per cent. formalin. It measured 5 cm. by 3 cm. by 3 cm. Its external surface was extremely ragged, and was covered by tags of greyish, tough tissue. On section it showed a mottled grey and white appearance. The white areas were larger than the grey. They were clearly defined, irregular in shape, and consisted of shiny, fibrillar closely-packed strands. The grey areas were depressed, softer than the white areas, and were both patternless and translucent.

Microscopic sections were stained by hæmalum and eosin, and by hæmatoxylin and van Gieson's method. The sections show bundles of unstriped muscle fibres, the bundles being of large and medium size. They pass in varying directions, and are seen cut longitudinally, obliquely, and transversely. The bundles are separated by strands of fibrous tissue, from which a collagenous meshwork arises and encircles the individual cells of the bundles. The muscle-cells are large. Scattered throughout the section are nodules composed of large polygonal cells. These nodules are infiltrated by a few polymorphonuclear leucocytes and lymphocytes. Blood spaces, lined by a single layer of endothelial cells, are present in considerable numbers in the nodules. The individual cells of which the nodules are composed are very regular in size and shape, and consist of a pale cytoplasm, and a single, large, rounded, usually eccentric nucleus with well-defined chromatin net, and one or two nucleoli. They lie in a hyaline collagenous matrix. Transition from the rod-shaped muscle-cell, with rod-shaped nucleus and ill-defined nucleolus, through the rod-shaped cell with spindle nucleus and sharply-defined nucleolus, to the spindle-shaped cell with oval nucleus, and then to the polygonal cell with rounded nucleus, is clearly seen. Fibroblasts are seen lying between the polygonal cells in the nodules. The appearances suggest transition from fibroblasts to polygonal cells, but this cannot be followed through the various stages with that facility which obtains in the case of the muscle fibres.

Decidual reaction arising in structures other than the endometrium is of frequent occurrence. It occurs to a slight or considerable extent in the connective tissues of the Fallopian tube in all cases of tubal pregnancy. It has also been described in the ovarian connective tissues in cases of ovarian pregnancy. It is frequently met with post mortem on the peritoneum forming the floor of Douglas's pouch, lateral pelvic walls, and has been noticed as far distant as the appendix, pelvic colon and surface of ovary. I have seen three specimens in which it occurred in the stroma of a cervical erosion. In each of these cases carcinoma was suspected, and in two of them hysterectomy by Wertheim's method was performed without sections being taken, so apparently certain was the diagnosis. I can find no other mention of decidual reaction in a fibromyoma in the literature, but its existence has been known to many of us for some considerable time.

I have to thank Dr. Russell Andrews for kind permission to publish this case, and also Dr. Hubert M. Turnbull for kind assistance in compiling the pathological report.

DISCUSSION.

Dr. LOCKYER: Mr. Gordon Ley is to be congratulated on making a very definite addition to our knowledge, in demonstrating the transition of involuntary muscle fibres into decidual cells in response to the stimulus of pregnancy. I have found decidual reaction in the ovary associated with ovarian gestation, and there are two ovaries in my collection showing a coating of decidual tissue from a case of intra-uterine pregnancy. As stated by Mr. Ley, the same reaction has been found on the serous coat of the appendix vermiformis and in various situations on the pelvic peritoneum. I have seen it on the surface of a uterus removed by Cæsarean hysterectomy, and Penkert has demonstrated the same in the omentum. Decidual reaction has also been noticed in the "cytogenous" or periglandular tissue of an adenomyoma by several observers, including Cullen, Whitridge Williams, Amos, Robert Meyer, and, in this Section, by Dr. W. S. A. Griffith. I feel sure Mr. Ley is right in affirming that the specimen removed by Dr. Russell Andrews is the first recorded case in which a pure fibromyoma has demonstrated decidual metaplasia of its muscle cells.

Dr. H. RUSSELL ANDREWS: I was puzzled by the appearance of the small tumour on the back of the uterus. It had a peculiar roughly granular surface and a rather grey colour. I thought that it was probably an adenomyoma, and was much interested to find that the microscopical sections showed decidual reaction in a fibroid and no trace of glandular tissue.

(*May* 3, 1917.)

Post-operative Tympanites: Its Nature and some Points in its Treatment.

By JOHN D. MALCOLM, F.R.C.S.Ed.

IN October, 1914, I published[1] five cases in which a post-operative tympanites, threatening to cause immediate death, was treated by making an intestinal fistula, and four of the patients recovered. The tympanites was attributed to an increased resistance to the passage of the intestinal contents, associated with an enfeebled peristaltic action, and especially to delay in the large intestine, these being regarded as effects of exposure and manipulation of the abdominal contents during the operation. It was suggested that the condition might be described as one of "acute intestinal stasis."

In 1915, Professor Arthur Keith[2] recorded the results of investigations into the nature of certain areas of nodal neuro-muscular tissue which consist of specializations of Auerbach's plexus of nerves. These areas of nodal tissue are situated at various parts of the alimentary canal where delays in the passage of its contents normally take place, for example at the ileo-cæcal valve and at the pylorus. Professor Keith concluded that the nature and functions of the myenteric plexus of the intestine are physiologically similar to those of the nodal and conducting system in the heart, and that each specialized nervous area is the originator and regulator of peristaltic activity in the section of bowel immediately beyond it. He pointed out that a want of co-ordination between the muscular activity of the various sections of the alimentary canal may give rise to effects comparable to those of heart block, and argued that the condition of intestinal stasis is produced in this way.

The application of Keith's explanation of intestinal stasis to the condition which I ventured to call an acute intestinal stasis aids greatly the understanding of the nature of a post-operative tympanites. In the course of a satisfactory convalescence from an uncomplicated operation upon the abdomen, gases pass to, and are expelled from, the anus, as a rule, on the second or third day. Unless these gases escape very early, say within twenty-four hours, the patient suffers from more or less abdominal distension, or a feeling of such distension with discomfort or crampy pains and nausea or vomiting. Prompt relief may generally be given after a day or two by administering a dose of castor oil, and apparently the purge is useful simply by restarting the muscular activity of the intestine, which without this stimulus may remain in abeyance. The symptoms above mentioned cease when gases escape freely through the anus, but if this relief is not obtained a condition of tympanites arises and becomes more obvious, distressing and dangerous. The distension and vomiting increase rapidly. Every variation, between the very slightest discomfort and a complete fatal retention of the intestinal contents, may be observed and therefore the most serious of these conditions would seem to be in some cases an exaggeration of changes which take place in nearly every case of abdominal surgery.

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[1] *Proc. Roy. Soc. Med.*, 1914-15, viii (Sect. Obst. and Gyn.), pp. 16-24.

[2] "The Cavendish Lecture," *West Lond. Med. Journ.*, 1915, xx. p. 149.

When a post-operative tympanites is fully developed the surgeon may still occasionally save his patient by opening and draining the intestine, at the cæcum or at some higher point. If the condition is cured in this way the distension subsides as quickly as the excess of fluids and gases in the small intestine is expelled through the fistulous opening, sometimes within two or three hours, and the case, if otherwise uncomplicated, is then put in the position, as regards symptoms, of one in which gases have passed freely from the anus. In the majority of such cases, after a delay of one or two days, an evacuation of the intestine *per vias naturales* is easily obtained, although every effort in this direction before the fistula was made had been ineffective. The conditions show that there is in these cases no real paralysis and no real obstruction of the intestine either above or below the place where the fistula is made.

When patients die with a fully developed tympanites unrelieved, even if the conditions are aseptic before the operation, and if the most careful precautions have been taken to prevent septic contamination of exposed tissues, an early stage of diffuse peritonitis is generally found at an autopsy. In my experience this condition is invariably present if the patient dies sufficiently slowly. Infecting organisms pass through the wall of the distended intestine and so reach the peritoneum when the patient is *in extremis*. If, during an operation, septic parts are manipulated or removed the surgeon often closes the abdomen, knowing that contamination of the peritoneum has occurred and trusting that the special powers of this membrane for destroying bacteria will protect his patient from infection. In properly selected cases there will be no danger so long as the convalescence is uncomplicated, but if under these circumstances a post-operative tympanites develops and is persistent, a diffuse septic peritonitis will arise earlier and spread further and more rapidly than in an aseptic case. Micro-organisms which have not been completely destroyed assert their pathogenic powers as the tissues become enfeebled.

On the other hand, if death is fairly rapid there may be no evidence of a diffuse peritonitis. Dr. Mary A. D. Scharlieb, in the debate on my last paper on this subject,[3] recorded a case in point. At a second operation nothing was discovered to account for a fatal tympanites except that the colon was enormously distended by fæces. No peritonitis was discovered at an examination afterwards. Moreover, after a tympanites is fully developed, when an operation is performed to look for an intestinal obstruction or to make a fistula, if the tissues are aseptic to begin with and carefully treated, there is rarely any sign of a diffuse peritonitis until the patient is moribund. Therefore the tympanites, for the relief of which the second operation is performed, cannot be caused by the peritonitis found after death in the majority of these cases. On the contrary the tympanites develops first and the peritonitis is an invariable result of the intestinal distension if the patient dies sufficiently slowly to allow an inflammation to develop.

It would appear, therefore, that in the cases under consideration no obstruction and no paralysis and no inflammation of the intestine precede the onset of tympanites. But it is certain that before the fistula is made the colon is not capable of receiving and removing the contents of the small intestine, whilst it is essential for the patient's safety that the small gut should be allowed to empty itself. The tympanites is therefore due to a complete obstruction of the intestine, with no other cause than a want of co-ordination between its upper and lower parts. The condition is one of acute intestine block or acute intestinal stasis.

The large intestine is by far the commonest situation of this trouble, but cases of acute dilatation of the stomach after abdominal operations are on record, and Keith's explanation of the nervous arrangements of the alimentary canal applies to this gastric distention as fully as to the ordinary every-day symptoms which sometimes develop into a dangerous state.

[1] *Proc. Roy. Soc. Med.*, 1914-15, viii (loc. cit.), p. 25.

A difficulty arising from a want of co-ordination between the various parts of the alimentary canal must be aggravated by any condition which tends to hamper the action of the part physiologically in distress, and so a formation of intestinal adhesions, an overloaded condition of the colon and any other circumstance which delays the passage of the bowel contents must help to bring about their retention after an abdominal operation. A subject of intestinal stasis will almost certainly develop an acute intestinal stasis unless the bowel is stimulated. The continuous administration of opium after these operations, at one time usual, was a definite cause of delay of fæces in the colon, and one of the most remarkable improvements in abdominal surgery is the reduction in the number of cases of difficulty and of death from post-operative tympanites which took place when surgeons ceased to lock up the bowels as long as possible after every abdominal operation. Without some complication tending mechanically to hamper the activity of the intestine, a serious degree of tympanites rarely, if ever, arises in aseptic cases, a brisk purge being generally sufficient to restore the functions of the bowel.

If a post-operative tympanites is to be treated by making a fistula there should be no delay in operating after the necessity for this measure has been determined, and it is evident that in every case in which a persistent post-operative tympanites can be cured in this way the development of that condition would be prevented if the surgeon could foretell the event and make a fistula as part of the original operation. This view is supported by the behaviour of three cases in which I performed major abdominal operations upon patients in whom a cæcal or lower ileal fistula existed. In each case during the first three or four days of convalescence there was an increased discharge from the artificial opening in the bowel, and then the flow ceased or greatly diminished, and recovery was rapid and free from trouble.

In two of these cases[1] the cæcum was closed subsequently without any complication during convalescence, so there was no intestinal obstruction. In the third case[2] the patient died of general tuberculosis, with the fistula and a very large tuberculous pelvic abscess still unhealed. In these cases the pressure in the cæcum and lower ileum was certainly increased during the first few days of convalescence from an abdominal operation.

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[1] Loc. cit., Cases II and V.

[2] Loc. cit., Case I.

After considering all the facts I treated and published, in the communication already quoted, two cases,[1] in which a fistula was made in the course of an abdominal section with a view to preventing the onset of a post-operative tympanites when this complication was thought likely to occur. The recovery, in both, was free from all cause for anxiety concerning the functions of the alimentary canal, and I have since operated upon eleven cases of this kind, and assisted at one successful operation for the relief of a fully developed tympanites.

Case I.—A healthy strong woman, aged 34, was seized suddenly with intense abdominal pain and became very ill. Two days later she had all the signs of an acute inflammation of the lower part of the abdomen, which was thought to be due to mischief in the vermiform appendix. The abdomen was opened without delay and opaque serous fluid and flakes of lymph escaped. The vermiform appendix had been inflamed at some time and was removed, but it lay on the outer side of the cæcum, and evidently it was not the cause of the patient's illness. There was no exudation of lymph in its neighbourhood. Both Fallopian tubes were dark-purple coloured and very much swollen, but the fimbriated extremities were free, and no pus could be expressed from them. On the left side the ovary and tube were partly adherent but easily released. There was no lymph on the tubes or ovaries. The pouch of Douglas, the back of the uterus, and the small intestine and its mesentery in the lower part of the abdomen were extensively covered by thick flakes of adherent lymph, which in places fixed the coils to each other. The intestines in the upper abdomen were red and distended, but there was no lymph on them. Nothing was removed except the appendix, the free fluid and some of the lymph. The pelvis was drained, and I fitted a Paul's tube in the cæcum through a second incision. The patient had a pulse of 150 when taken from the operating table, but it was 96 next morning. The Paul's tube acted well, and the patient's condition caused no anxiety during convalescence. The tube in the peritoneal cavity was removed after a few days. There was in this case great difficulty in getting the bowels to act by the natural way. Twenty-nine days after the operation I reopened the abdomen. All the pelvic parts seemed normal except the left ovary, in which a cyst measuring about 2 in. in diameter had developed. This burst in removal. To avoid the effects of any cause of obstruction in the colon, I performed an ileo-sigmoidostomy and closed the cæcum. Recovery gave no anxiety, and eight months later the patient was in perfect health, except for a small incisional hernia which should be repaired.

The cause of the symptoms in this case was obscure. A cyst similar to that removed at the second operation may have burst when the patient became ill, but the bursting of such a cyst would hardly account for the conditions found.

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[1] Loc. cit., Cases VI and VII.

I have since operated under very similar circumstances, but there was no exudation of lymph. The Fallopian tubes closely resembled those above described, and treatment by drainage of the peritoneal cavity alone was successful. There was a very foul discharge from the drainage tube for three days. Neither of these patients had any vaginal discharge at any time. In the second case, repeated examinations of swabs from the vagina before the patient became acutely ill and before I saw her were negative, but there was no doubt that this patient transmitted gonorrhœa from one man to another. In both cases the mischief was probably gonorrhœal. The degree of inflammation in the first case was certainly sufficiently severe to justify a belief that intestinal difficulties were likely to arise.

Case II.—A patient, aged 43, had pan-hysterectomy performed on account of a painful inflamed adherent fibromyoma of the uterus. Between the uterus and the rectum there was a calcareous mass measuring about ½ in. in diameter, and in removing this I opened the rectum. It was closed by sutures, and the peritoneum was arranged so that if a fistula formed the fæces would pass into the vagina rather than into the peritoneal cavity. To rest the rectum, and so facilitate its healing, a Paul's tube was fixed in the cæcum. Convalescence was uninterrupted except that for about three days, after the bowels had begun to act naturally, there was a discharge of fæces through the vagina. The cæcum was closed thirty-five days after the operation, and the patient was reported well a year later.

Case III.—On exploring the abdomen I found a cancerous growth of the transverse colon, narrowing its lumen and causing distension between the stricture and the ileo-cæcal valve. It was doubtful whether the patient could bear a resection of the part or an ileo-sigmoidostomy, and therefore I opened the cæcum and fitted it with a Paul's tube. When this was done the patient seemed to maintain her strength, so I removed the transverse colon wide of its growth and joined the ends. The pulse did not rise above 108, and the Paul's tube was acting well by the end of the operation. The cæcum was closed after twenty-four days and recovery was satisfactory, but fifteen months later a recurrence affected the liver.

Case IV.—The specimen removed from this case has already been shown to the Section.[1] An abscess formed around a fibromyoma in the posterior wall of the uterus. This burst into Douglas's pouch, and the abscess cavity at the operation was formed by the widely opened gap in the uterine wall and by adherent peritoneum, the sigmoid flexure and its mesentery forming the greater part of the upper boundary. A sloughed fibroid about the size of a billiard ball was free in a large collection of pus, which occupied nearly the whole pelvi cavity. The uterus was removed and the pelvis was packed with gauze. The sigmoid flexure on its lower surface had a blue-black colour, and appeared likely to become gangrenous. It was also so fixed that it could not be pushed down to meet the bladder peritoneum. I therefore introduced a Paul's tube into the cæcum to rest the pelvic parts. The cæcum discharged its contents through the fistula, until a dose of castor oil on the third day induced a free evacuation *per rectum*, after which the artificial anus hardly acted at all, and recovery was so satisfactory that the need for the fistula seemed doubtful. It must, however, be remembered that there was a considerable escape from the cæcum during the first three days of convalescence, and this is the time when a post-operative tympanites usually begins, and when an undisturbed pelvic condition is important. After thirty-nine days the cæcum was closed easily, and there was no subsequent trouble. The pelvic parts were completely healed when the patient recovered from the second operation.

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[1] *Proc. Roy. Soc. Med.*, 1914-15, viii (Sect. Obst. and Gyn.), p. 104.

Case V.—A patient, aged 63, twenty years after a hysterectomy by another surgeon, had a hernia in which a large portion of the intestine was fixed by adhesions. The cæcum and many coils of small gut were separated and replaced in the abdominal cavity with difficulty on account of their size. I made a cæcal fistula in this case to prevent undue tension, which must have arisen from the slightest degree of tympanites. The cæcum was closed thirty-nine days later, when the size of the intestines and of the peritoneal sac had become accommodated to each other, and there was no trouble after either operation.

Case VI.—Six days after removal by Dr. Hubert Roberts of a ruptured extra-uterine fœtation with much blood-clot, the patient, aged 33, showed symptoms of intestinal obstruction. Three days later I saw her in consultation and assisted at a second operation, concerning which Dr. Roberts kindly allows me to publish the following. On reopening the abdomen about half a pint of serous fluid escaped. Distended small intestine, 2 in. in diameter, was seen in the upper abdomen, where a slight volvulus of many coils had formed. This part of the intestine was incised and drained, the wound being carefully closed. Many recent adhesions, mostly in the pelvis, were broken down. The whole of the peritoneum was reddened, and it looked very unhealthy, but there was no pus anywhere. A Paul's tube was fixed in the cæcum and a rubber tube in the pelvis. An uninterrupted convalescence followed, and I closed the cæcum twenty-six days later. Recovery from this also was uneventful.

Case VII.—A child, aged 4½, complained of abdominal pain, which passed off. At the end of a week she was very ill. A doctor was then called in, and when I saw her, on the eighth day after the first symptom, the abdomen was distended and immobile. I removed an enlarged, very red appendix from far back in the abdominal cavity. To get the intestines out of the way it was necessary to incise and drain them. The opening in the bowel was sutured, a Paul's tube was fixed in the cæcum, and the abdomen was closed, but the child died a few hours later. The only way to have saved this patient's life was to have operated much earlier. The intestine was paralysed as a consequence of septic peritonitis.

Case VIII.—This case is already published.[1] After removal of both ovaries and Fallopian tubes an enormous pneumo-peritoneum developed. The gas was let out, and it was seen that all the intestines were adherent, although they were not so at the first operation, seven days earlier. They were rather empty than distended. The cæcum was drained, and recovery was in every way satisfactory. The fistula was closed four weeks later.

Case IX.—An exceedingly anæmic, unhealthy-looking woman, aged 21, became acutely ill, and on opening the abdomen a cystic ovary almost universally adherent on the right side, measuring about 2½ in. in diameter, was removed with an inflamed Fallopian tube. On the left side the tube and ovary were adherent and seemed to be enlarged. In separating them my finger slipped into a mass of exuberant granulation tissue, which constituted the apparent enlargement of the ovary. This tissue was continuous with the mucous membrane of the sigmoid flexure through a considerable gap in its muscular wall. After removing the unhealthy mass, the edges of the opening in the bowel wall were freshened, and it was closed by catgut sutures, but these were necessarily placed in unhealthy tissues. The pouch of Douglas was drained by means of a rubber tube, and the cæcum by a Paul's tube. Recovery was not complicated in any way. Fæces escaped freely at first from the fistula but gradually passed downwards more and more. The peritoneal discharge soon ceased and gave no trouble. After four weeks I closed the fistula, and an adherent unhealthy vermiform appendix was excised with some difficulty because of the depth and fixity of the cæcum. Recovery was uneventful, except that the wound did not heal by first intention.

Case X.—A woman, aged 28, was sent into hospital acutely ill. Her condition improved, and after five days I operated and found an appendix abscess in the pouch of Douglas rather to the left side. A large granulating surface on the sigmoid flexure and another on the last few inches of the ileum and around the base of the vermiform appendix were cleaned as much as possible. The ileum was divided above the raw part, and the upper end was inserted into the side of the ascending colon. The lower end was brought out through a lateral incision and fitted with a Paul's tube. Drainage of the pelvis was arranged through the vagina, and the abdominal incision was closed. Gases and fæces escaping from the fistula had to pass backwards through the ileo-cæcal valve, and hardly any fæces were discharged in this way, but enough gases escaped to prevent any abdominal distension, and recovery was satisfactory, being altogether free from intestinal difficulties. The fistula was closed twenty-three days after the operation, and recovery was again uncomplicated.

Case XI.—When this patient's age was 21 both her Fallopian tubes, her right ovary, and part of the left ovary were removed for suppurating inflammation. Seven years later she returned with a swelling on the left side of the pelvis. An inflamed cystic ovary, buried very deeply in the pelvis, was enucleated with difficulty, but I thought satisfactorily, and the abdomen was closed, after the uterus had been fixed, so as to keep the intestines away from the large area of raw tissue necessarily left. During the following night some blood escaped from the rectum, and next morning fully half a pint of fluid blood was discharged when a tube was introduced through the anus. As it was obvious that there had been an injury of the bowel, I fixed a Paul's tube in the cæcum through a lateral incision without delay. I then reopened the median incision. There was no blood in the general peritoneal cavity, but on lifting up the uterus a clot was seen. After clearing this out two small vessels were ligatured, drainage through the vagina was provided, and the abdomen was closed. No opening in the bowel was discovered, and no visible fæces had escaped from it. This patient's condition never became satisfactory, gases and fæces escaped both from the fistula and from the anus, but never freely either way, and after a time they ceased to pass. The patient then began to vomit, and she died on the eighth day after the second operation without becoming greatly distended.

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[1] *Proc. Roy. Soc. Med.*, 1916, ix (Sect. Obst. and Gyn.), p. 85.

The following statements are taken from Dr. Salusbury Trevor's report of the autopsy:—

> The deep part of the central wound had not healed well. There was a general peritonitis with lymph in the pelvis over the viscera. The last 3 ft. of the ileum were empty and collapsed, the upper end of this collapsed portion being fixed to the back of the central wound by adhesions which caused an obstruction. The upper parts of the small intestine were moderately distended.
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> The colon was empty and mostly collapsed. The uterus was fixed to the rectum. To the left of the uterus was a cavity containing grumous fluid, shut off by adhesions and well drained through the vagina. There was a tear in the rectum ¾ in. long low down on its left side. Death was attributed to "syncope from general septic peritonitis and acute small gut obstruction."

After the autopsy it seemed to me that in this case the intestinal adhesions to the back of the central abdominal incision followed immediately upon the second operation. These adhesions were the cause of the inefficient flow of the bowel contents. After a time the intestine became completely obstructed, and the diffuse septic peritonitis followed. This patient lived eight days after the second operation, and a spreading septic peritonitis as the primary source of trouble would, in my opinion, have caused death much earlier. The upper intestine was not paralysed even just before death. If it had been it would have been much more dilated. A fistula formation higher up the bowel, or a short circuiting, should have been undertaken by a third operation.

Case XII.—A woman, aged 54, was seized with pain early one morning. She consulted Dr. James Gaff next evening and was admitted to the Samaritan Free Hospital a little more than two days after the first pain was felt. The condition was not alarming but the pain, which had become localized in the vermiform appendix region, had not abated. I operated exactly two and a half days after the illness began. A median incision exposed a very red peritoneum and adhesions over the cæcum. On separating these some pus escaped and when the parts were fully exposed a black slough consisting of the mucous membrane of the appendix was seen lying in a hollow on the lower part of the cæcum. This hollow consisted of the muscular wall of the appendix firmly adherent to the cæcum and ruptured along its whole length. On each side of the hollow the bowel wall was of a blue-black colour over a width of about ½ in. The surrounding coils of intestine were thickened and ulcerated. The slough was lifted out and the proximal end of the mucous membrane of the appendix was tied and cut off through fairly healthy tissue. The cæcum had become so fixed that it could not be brought forward. I divided the ileum near the ileocæcal valve and closed the lower end. The upper end was fitted with a Paul's tube and brought out of the incision. The area around the appendix region was drained by tampons and tubes. A separate tube drained the pelvic cavity. The Paul's tube acted well and there were no intestinal symptoms. The drain in Douglas's pouch was soon removed, but a large unhealthy cavity remained connected with the cæcum and when the Paul's tube separated, on the eighth day, this cavity was constantly covered by fæces. On the thirteenth day there was some secondary hæmorrhage on three occasions. I would have preferred to wait until the parts were more healthy, but in view of the hæmorrhage I opened the abdomen fourteen days after the first operation. To avoid the cæcal region I made an incision through the left rectus muscle, divided the bowel as low as possible and introduced its upper end into the transverse colon. In case I had made a mistake as to which was the upper end I brought the lower end on to the surface, thus leaving a part of the ileum with both its ends open. After this the intestinal condition gave no trouble, the wound over the cæcum became rapidly healthy, and secondary hæmorrhage did not recur, although for a short time fæces escaped which must have come through the wall of the cæcum. It was seven and a half weeks after this operation before I could remove the lower piece of ileum, which to my surprise measured 41½ in. between the two openings. The patient made a good recovery, going home twenty-eight days later.

The results of these operations with two exceptions, were altogether satisfactory as regards the absence of intestinal difficulties, but it is impossible to prove or to disprove the view that the making of a fistula to prevent the onset of a post-operative tympanites was useful. Operations upon the abdomen may appear so desperate that overwhelming complications seem almost inevitable and yet there may be no hitch in the progress of recovery. It may be, therefore, that my prognosis was wrong every time. On the other hand a consideration of the cases will, I think, show that many of them were fairly likely to have had, at the best, a troubled convalescence if no fistula had been made, and yet the recoveries were more free from anxiety than the average. This is one of the chief features of the method. If a fistula is made to prevent the onset of a post-operative tympanites and this object is attained, the patient escapes in great measure, or altogether, even the small discomforts which are very common before gases pass from the anus. And although these discomforts are usually not important, so long as they last the surgeon cannot be sure that the resistance to the downward passage of the intestinal contents will not overmatch the propelling forces. It seems to me, therefore, that by making a fistula in the course of surgical treatment of an abdominal condition, and allowing an escape of gases and fæces through the cæcum or at some higher point, we have an exceedingly powerful means for averting intestinal troubles after these operations.

It may be suggested that it is time enough to make the fistula when the tympanites has arisen and all other methods have been tried. I am convinced however that in some cases, for example in the case already published,[1] in which the making of a fistula failed to relieve the tympanites, the patient would have a better chance of recovering with a fistula made to prevent the onset of a post-operative tympanites, than by any method for curing this condition.

It is obvious, and I would strongly urge, that on account of the uncertainty as to when a fistula is necessary, the disagreeable features of this treatment, the prolonged illness, and the need for a second operation, this method should not be employed without good reasons and it ought not to be required very often, although the frequency of its usefulness must vary with the nature of the work coming to hand.

The seven cases published before[2] and the first five of those recorded now include all[3] in which I made a fistula for the prevention or cure of a post-operative tympanites in a series of 1,000 consecutive operations involving the peritoneal cavity. In 554 cases the disease was in the female pelvic organs, the mortality of these being 2·52 per cent., and I considered myself fortunate in getting a death-rate of 3·8 per cent.

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[1] *Proc. Roy. Soc. Med.*, 1914-15, viii (loc. cit.), Case IV.

[2] *Proc. Roy. Soc. Med.*, 1914-15, viii (loc. cit.), p. 16.

[3] Cases of fistula for acute intestinal obstruction, of an anastomosis for any cause, and of colotomy for cancer are not counted.

for all the cases, the lowest I have had in so long a series of abdominal operations.[1] This would have been at least 4·2 per cent. if post-operative tympanites had never been treated by making a fistula, for life was certainly saved in four of the cases[2] when the patients were beyond all hope of recovering without this method. I have not made a fistula for the cure of post-operative tympanites since these cases were published, but I have assisted at one operation of this kind, Case VI *ante.* Whether I have forestalled the onset of this complication by making a fistula in advance must be a matter of opinion. I feel sure that some of the cases now recorded would have developed a post-operative tympanites, and some would have been added to my death-rate, if the fistula had not been made, but quite likely in some this treatment was not essential.

In making a fistula for the relief of a post-operative tympanites signs of a diffuse peritonitis are occasionally seen, and it may sometimes be doubtful whether this peritonitis is the cause or the effect of the abdominal distension. In many published cases,[3] when treatment by draining the intestine was carried out, the signs of a slight diffuse peritonitis were ignored, the abdomen was closed and the patient recovered well. When this peritonitis is more advanced, as in Case VI above, and in many other published cases, drainage of the intestine must be supplemented by drainage of the peritoneal cavity if success is to be obtained.

The circumstances resemble those observed in certain cases of gangrene of the vermiform appendix. In removing this condition the surgeon frequently finds some inflammatory serous exudation from a local diffuse peritonitis, which as a rule may be safely neglected if the exuded fluid is clear. When a peritonitis is more advanced it is often a nice question whether the peritoneal cavity should be drained or not, but if the septic mischief is still further developed drainage becomes necessary. These changes may arise without any tympanites. When, as in Case VII *ante*, the peritonitis is so advanced as to paralyse the intestine the chances of recovery by any treatment become very remote.

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[1] Notes of the first 400 of these cases have been published : "Remarks on 400 Operations involving the Peritoneal Cavity and a Comparison of the Death-rate, 3·75 per cent., with the Writer's Earliest Works," *Practitioner*, March, 1912. In the last 600 cases the mortality from the gynæcological work was higher, that from the others lower ; although the mortality was practically the same, a considerably larger number of the simpler operations was handed over to the house surgeon, and all of these recovered.

[2] *Proc. Roy. Soc. Med.*, 1914-15, viii (loc. cit.), Cases I, II, III, and V.

[3] For example see *Proc. Roy. Soc. Med.*, 1914-15, viii (loc. cit.), p. 16, Case III.

The conditions in a case of gangrenous appendix treated by its removal and those of a post-operative tympanites successfully treated by drainage of the intestine seem to me exactly parallel as regards their relationship to any existing diffuse peritonitis which is curable. Removal of the gangrenous appendix or of the distension of the intestine is essential, and nothing else is essential to the cure of the peritonitis in the milder cases; and therefore the appendix condition and the distension of the intestine, at least in these milder cases, are respectively the causes of the peritonitis. The peritonitis in these cases of post-operative tympanites is an early development of the inflammation which, as described above, invariably occurs before death if the patient dies slowly. The more advanced cases clearly may have the same origin as the milder cases.

Peritonitis is, of course, a well-known cause of paralysis of the intestine and of tympanites, but when, as in the cases just considered, it is caused by an abdominal distension and curable by removing the distension, it cannot at the same time be the cause of the distension.

The word peritonitis is not infrequently used in the vaguest manner. On a former occasion[1] I compared it with dermatitis. The superficial area of the peritoneum cannot be very far short of that of the skin and we convey very little information when we say that a patient has dermatitis or peritonitis without some qualification describing the nature and position of the inflammation. In the paper referred to I pointed out in particular that the expression "general" peritonitis is often used when a diffuse spreading, but not general peritonitis, is obviously meant.

Lister taught that "a certain amount of inflammation, as caused by direct irritation, is essential to primary union,"[2] and according to this view a localized aseptic peritonitis arises in connexion with the healing of all wounds of the peritoneum. This inflammation is harmless, but it may cause a formation of adhesions, and such adhesions are also harmless, except when they are placed so as to hinder the activity of the intestine or obstruct its lumen, by which they may, and not infrequently do, become an important cause of intestinal difficulties, and of death after operations.

A spreading peritonitis is always septic, but except in some cases of tuberculous inflammation, it seldom becomes general. Even if a general peritonitis does arise the inflammation spreads from some focus of infection, and usually involves only a part of the peritoneum before it is arrested by death or by curative measures. To cure a diffuse septic peritonitis it is essential to remove its cause or to localize its effects by draining the part of the peritoneal cavity which is affected. As a rule, in the early stages of a diffuse peritonitis, when the cause is removed the peritoneum, as already stated, destroys all remaining septic organisms, and the inflammation subsides and is harmless. Under such circumstances, there is no paralysis of the bowel. But if the peritonitis continues to spread, a paralysis of the whole intestine eventually follows, and this condition when thus produced is hopeless. Drainage of the peritoneal cavity is essential to recovery when the cause of a spreading peritonitis is irremovable, and it cannot be provided too quickly. Indeed, if, after an abdominal operation, the peritoneal sac is closed without drainage, and if a diffuse peritonitis arises and is the cause of a tympanites within a few days, the surgeon must have committed an error of judgment in failing to provide drainage during the operation, just as, if it becomes necessary to drain a tympanitic intestine, the conclusion is clear that drainage of the bowel would have been arranged with advantage at the primary operation, for both draining the peritoneum and draining the intestine are more certain in their effects when they are employed to prevent trouble than they are as curative measures.

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[1] "Inflammation and Peritonitis considered as Physiological Processes," *Med. Chir. Trans.*, lxxxix, 1906, p. 292.

[2] Lister, *Phil. Trans.* (1858), 1859, cxlviii, p. 700.

When the peritoneum is drained to cure a septic peritonitis or to prevent its onset, drainage of the intestine also may be useful by removing or preventing the onset of a dilatation of the intestine which is an originating and aggravating cause of peritonitis, but when the bowel is paralysed as the effect of a diffuse septic peritonitis, the making of a fistula will not empty more than a small portion of it, and even if we could drain the whole intestine this could not have any curative or even arresting effect upon a diffusing peritonitis, which is the cause of the paralysis.

It is of the utmost importance to recognize that tympanites and peritonitis may each be an indirect cause of the other, but each may be brought about also directly in another way. Tympanites may be caused by an obstruction of the intestine (mechanical or physiological), and septic peritonitis by bacterial infection. In one set of cases an intestinal obstruction causes tympanites, and peritonitis follows. In another set of cases septic infection causes a spreading peritonitis, and tympanites follows. Neither of these developments can be understood without recognizing the other, and if they are not both fully considered much confusion must arise between the peritonitis which causes distension of the bowel and the peritonitis which is caused by distention of the bowel.

It may be exceedingly difficult to disentangle the symptoms in an individual case, and the two causes of tympanites may arise independently but practically at the same time. Thus, as a consequence of an operation, and dating from immediately after it, there may be a few or many peritoneal adhesions, and a post-operative tympanites may arise from the presence of these adhesions, aggravating the usual delayed action of the bowel. There may also, in the same case, be a diffuse peritonitis. This peritonitis may be due to a bacterial infection from a stirring up of some septic focus during the operation, or from an introduction of septic organisms and neglect of the drainage necessary in such a case, or the diffuse peritonitis may be due to a septic infection from a passage of organisms through the distended bowel—a condition which must arise sometime if the patient with post-operative tympanites dies slowly. Unless the preceding history indicates it clearly, there is no way in which the surgeon can tell which of these two conditions is the cause of the diffuse peritonitis except by the effects of treatment. If the post-operative tympanites and all signs of peritonitis are removed by draining the intestine, and especially if no other treatment is necessary, the conclusion is obvious that the distension is the cause of the peritonitis. If this treatment does not effect a cure, unless the history is clearly in favour of one view, it must, I think, remain uncertain whether the sepsis arose from some condition existing before or introduced at the operation, or whether micro-organisms escaped through the distended gut, and the consequent septic inflammation advanced too far to be curable by draining the intestine.

When there is a possibility that both causes of post-operative tympanites may arise, the need for doing all possible to prevent its onset is most urgent. For example, when the peritoneum has been fouled by septic material the patient may make a perfect recovery if no complication arises, but a fatal septic peritonitis may rapidly develop if the intestine becomes distended. On the other hand, a septic peritonitis may arise and cause intestinal paralysis and tympanites. In such circumstances the surgeon, by making a fistula in the course of the operation, if this succeeds in draining the small gut, may ensure the patient against an intestinal distension which, once started, might render the case hopeless, because a septic infection might follow and develop so quickly. In the same way, by draining the peritoneal cavity, he would reduce the chances of septic mischief spreading.

The indications for making a fistula as part of an operation are difficult to formulate. A prognosis of the patient's progress two or three days in advance is necessary. But conditions in which it seems essential to rest the lower bowel, either because it is wounded or to allow of undisturbed drainage of the pelvis, point clearly to a need for tapping the cæcum.

In cases of much manipulation or injury of the small intestine the advantages of making a fistula should also be considered. I have never had an opportunity of treating extensive wounds of the abdomen such as those which must frequently come under the notice of the members of the Royal Army Medical Corps at the present time, but if in such circumstances I could make a continuous alimentary canal, and if the patient's condition were otherwise satisfactory, it would still be wise in some cases to provide efficient drainage of the peritoneum, and in some I should consider that provision for an immediate escape of the contents of the small intestine through a cæcal fistula would offer a better chance of recovery than leaving the fæces to escape after a day or two by passing through the colon. As pointed out in the early part of this paper, the small intestine in most cases of abdominal surgery is ready to push down its contents very soon after the abdomen is closed, but the large intestine rarely acts until twenty-four or forty-eight hours later. An immediate and free escape of the contents of the small intestine from a cæcal fistula, without making it wait for the large bowel, removes all strain upon sutures or weak parts in its wall and, by facilitating vermicular movements, reduces the tendency to a formation of adhesions. Damage to any part of the large bowel would be an additional reason for making a fistula.

In conclusion, I submit for the consideration of the Section that by making a fistula in the cæcum or in some other part of the intestine in suitable cases in the course of an operation, the mortality from abdominal surgery may be reduced by a case here and there, and that patients whose lives may be saved in this way are generally suffering from an intestinal obstruction, brought about by a disturbance of co-ordination between the muscular activity of the different parts of the alimentary canal, aggravated perhaps by mechanical, physiological, or therapeutic hindrances to the flow of the intestinal contents, the colon being the part in which difficulty most frequently arises.

DISCUSSION.

Dr. **Amand Routh**: I have had considerable experience of post-operative apyrexial tympanites but have never felt called upon to re-open the abdomen for this condition; I consider that the formation of a cæcal fistula is a drastic procedure, unless other measures have been previously adopted, such as hypodermic injection of pituitrin or better still of eserine. On several occasions I have used one of these drugs and usually in about twenty minutes after their injection, a copious expulsion of flatus and fæces has occurred, with immediate cessation of all the symptoms.

Dr. **Cuthbert Lockyer**: Mr. Malcolm has drawn attention to the problems involved in dealing with post-operative intestinal complications. Major operations on the pelvic organs should be undertaken only by those who possess a practical working knowledge of intestinal surgery. Circumstances may arise during an operation on the pelvic viscera which necessitate, first, an enterotomy for the reduction in size of distended coils of intestine; secondly, enterorrhaphy, or even enterectomy, for injured or gangrenous bowel; thirdly, colostomy, for injury to the rectum or for malignant disease. With all these procedures I am quite familiar. But Mr. Malcolm's practice of creating an intestinal fistula during a pelvic operation as a preventive measure to possible intestinal stasis, or, what is commonly called *ileus paralyticus* is, to me, quite a novel idea. I have not gathered, from listening to the paper, how a decision is reached as to when such a procedure is to be adopted. If, after this treatment, recovery takes place, how can it be shown that the happy result was in any way dependent on the "preventive" fistula? Opening the cæcum as a "preventive" to small-bowel distension is a plan the *rationale* of which I fail to understand; on the other hand I have proved the value of eserine, pituitrin, and also of hormonal, in cases of distension due to inhibited peristalsis. Enterostomy, when once post-operative ileus has set in, is a well recognized method of treatment, the success of which depends on early interference; in my opinion it is rarely successful after the fourth day. In such cases the distension commences in the upper part of the intestine; the opening should, therefore, be made in the jejunum.

Dr. **Hubert Roberts**: Mr. Malcolm has made a careful record of some very difficult cases. I have recently had under my care two cases of the same nature in which the intestine was opened for post-operative tympanites. Certainly Mr. Malcolm's results seem good, but I am not clear as to whether his cases were all operated upon for post-operative tympanites, or whether some were thus treated to "prevent" this condition; if for the latter reason, in what class of case does Mr. Malcolm propose to operate? Franklin H. Martin, of Chicago, in Eden and Lockyer's "System of Gynæcology" just published, gives a very good account of this condition and has divided the post-operative obstructions into: (*a*) real obstructions; (*b*) paralytic ileus;

(*c*) peritonitis. There is a great difficulty in the diagnosis of these conditions, and it is a grave question as to whether or not in such cases the abdomen should be reopened. In real obstruction, whether immediate or late, operation is essential. In the so-called paralytic ileus, a very indefinite term, operation in certain cases is necessary if other therapeutic measures such as the administration of pituitrin, eserine, purgatives, turpentine and castor oil enemata, &c., fail. In these cases the distension of small bowel without grave constitutional symptoms is very insidious and deceptive and the whole question centres itself in arousing the intestine to act at all. If the distension gets worse, then enterotomy or enterostomy is called for in certain cases. The cause of so-called paralytic ileus is not clear. Keith's suggestion of the non-action of the neuromuscular tissue, specialized from Auerbach's plexus, situated where delays in the passage of the bowel contents normally take place (Malcolm), seems acceptable. In my opinion the action of the intestine may be in a way comparable to that of the uterus. If the uterine muscular coat is the analogue of the intestinal muscularis mucosæ, it is possible that intestine and uterus may behave in a similar way. In the uterus we are cognizant of "disturbances of polarity," vicious retraction and contraction, or complete exhaustion, as seen in post-partum hæmorrhage. Possibly paralytic ileus is due to a similar cause. Opening the intestine or abdominal drainage in peritonitis is preventable by aseptic technique, and real obstruction from adhesions is less likely to occur if greater care be taken in abdominal operations to avoid injury to bowel and to cover over all raw surfaces, especially those made in the removal of chronically inflamed appendages. Further, it is good practice in such conditions not to work in small spaces, but to make adequate abdominal incisions to "see" what we are doing. I have found it useful to give small doses of strychnia ($\frac{1}{30}$ gr.) hypodermically for one or two days before an abdominal operation, with the idea of "sensitizing" the intestines, and after the operation the sooner the bowels are made to act by purgatives or enemata, the better. In conclusion, I agree with Mr. Malcolm, that "in certain cases" either enterotomy or enterostomy gives good results, but the operation should be done directly the condition of tympanites becomes evident.

Mr. J. D. MALCOLM (in reply): Indications for making a fistula to prevent a development of tympanites are very difficult to formulate. I have been led to adopt the treatment because in certain cases of intestinal obstruction the formation of a fistula offers the best, sometimes the only, chance of saving a patient's life. The more the conditions approximate to those of an acute intestinal obstruction, the more the formation of a fistula will be found useful. The method is not one for frequent use, and in the thousand cases mentioned a fistula was made to cure or prevent the onset of tympanites in only 1·2 per cent. of the operations.[1] It was distinctly stated in the paper that it is impossible to prove that any patient who recovers with a fistula made to prevent the onset of tympanites has recovered because of the fistula formation. It can only be said that when the conditions seemed likely to give rise to tympanites in a number of cases a fistula was made and a complete absence of all bowel difficulties followed. I have been unfortunate in my experience of the use of pituitrin and eserine, which have not always been effective. A cæcal fistula was not made when a difficulty had arisen in the small intestine, but in a large number of cases of tympanites the difficulty is in the colon. The expression "ileus paralyticus" has been used. If this means that the ileum is paralysed, that condition does not exist in the cases that are curable by making a fistula. When a patient has paralysis of the ileum nothing can save him, and when the formation of a cæcal fistula is followed by a subsidence of ileac distension, there is certainly no paralysis of the ileum. The chief object of my paper is to show that in the great majority of the cases under consideration the difficulty is due to a delayed action, but not a paralysis of the large intestine, and that peritonitis is very often a consequence and not the cause of tympanites.

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[1] Cases of fistula formation for acute intestinal obstruction, of anastomosis for any cause, and of colotomy for cancer, are excluded from this statement.

(*May* 3, 1917.)

Two Cases of Primary Ovarian Pregnancy (with a Review of the Literature, 1910-17).

By CUTHBERT LOCKYER, M.D.

UP to the year 1909 the subject of primary ovarian gestation has been critically reviewed by several writers, but since this date, so far as I can ascertain, no systematic record of recent cases has been published. The task of deciding which cases are genuine from the large number published is no easy one, and this fact is borne out by the different conclusions arrived at by those who essayed the work prior to the year 1909. For example, Werth, in 1887, collected twelve "genuine" cases. Two years later, Leopold brought the number to fourteen, giving a short account of each case. In 1902 Füth raised the series to twenty-one; eight of these, or 38 per cent. of the total, being full-term pregnancies. Warbanoff, in 1909, collected thirty-three cases, including that of Madlener, which he described in full. So much for German statistics. We find a contrast directly we turn to American literature. Whitridge Williams, writing on the subject in Kelly and Noble's "Gynæcology and Abdominal Surgery," which was published in 1908, accepted as authentic thirteen cases only, his series beginning with Gottschalk's case published in 1893 and ending with that of Webster, published in 1904. In addition to the thirteen "positive" cases, Williams classed seventeen as "highly probable"; eight of these had gone to term or beyond. In a third division we find five "probable" cases, four early and one late. Finally, there were eleven so imperfect as to be considered "doubtful." Thus a total of forty-six is reached, of which thirty-five were among the "positive," "highly probable," and "probable." In the thirteen "positive" cases two went to term.

In 1909 C. C. Norris concluded that there were only nineteen authentic cases published between 1899 and 1909. It will be noted that Norris adopts the English standard of excluding cases published before that of Van Tussenbroeck in 1899, and herein lies, to a great extent, the disparity between the German and American estimates, which up to 1909 are, as shown above, thirty-three to nineteen. I have commenced my series with the year 1910, so as not to overlap the previous tables, but it is quite possible that this introduces a break in the continuity and that several of the 1909 cases are excluded. I cannot form a judgment on this point, because Warbanoff has buried his 1909 statistics in the oblivion of a Munich Dissertation, which, for obvious reasons, is not accessible at the present time.

Moreover, on account of the war, it is quite probable that many cases I have had to exclude, owing to the meagre reports in current summaries, would prove worthy of inclusion among authentic cases had the original, or fuller, accounts been at my disposal. I have discovered in all forty-two cases in the period 1910-17 (March). Twenty-two of these I have classed as genuine, which, added to those of Norris, makes a total of forty-one authentic cases up to date. I cannot take Warbanoff's statistics into consideration, not having seen his article. Twelve cases have not been accepted, but have been described so that the reasons for their exclusion may be demonstrated. Of the remaining eight nothing can be stated, as the periodicals in which they appear are not at my disposal. The cases regarded as genuine, and those which have been excluded, are described in Series I and II respectively, and in each series the cases are arranged according to the year in which they were published.

Before proceeding to deal with the published cases, I will record two examples which have been met with in my own practice:—

CASE I.

F. H., a married woman, aged 23, was sent to the Gynæcological Department of Charing Cross Hospital on July 14, 1915, by Dr. Vernon Muller, complaining of metrorrhagia and pain in the lower abdomen. She had borne two children, the younger being aged 1, and subsequently there had been an abortion (seven months before admission). The catamenia for the past six months had been regular, every four weeks, lasting from five to seven days, until three weeks ago, when the flow appeared one week before time and had continued ever since. For seven weeks there had been continuous pain in the lower abdomen and in the sacral region; this was sharp and stabbing in character, worse on movement and after food, and considerably aggravated during the periods. There was slight leucorrhœa. Micturition was normal. The bowels were regular. The patient had suffered from rheumatism in the right shoulder, left knee, and wrists.

Mr. Gordon Ley, the registrar, examined the patient in the Out-patient Department, and noted "cervix points to the left and behind; it is soft and a little patulous. Uterine body small, just a little mobile, and lies to the right. There is a mass the size of a large tangerine orange in the posterior fornix; it is tender, soft, and doughy; it moulds the pelvic floor and is fixed. Diagnosis: Left pyosalpinx." On September 4 the patient was admitted into the gynæcological ward under my care. I found a tumour in the left posterior quarter of the pelvis which was semi-fixed and tender. I regarded it as a tubo-ovarian inflammatory mass and proceeded to treat it with hot douches and electric-heat baths. This was continued for about five weeks, when, finding that there was very little, if any, reduction in the size of the swelling, I decided to operate.

On October 19 I opened the abdomen, and, with Mr. Gordon Ley's assistance, removed the left Fallopian tube and the enlarged left ovary. The opposite appendages were adherent. The abdominal end of the right tube was sealed. On this side I freed the adhesions and made an artificial ostium in the tube. Finally the uterus was suspended by Gilliam's method. There was no free blood in the peritoneal cavity. During the operation, as soon as the left ovary was brought into view, I remarked to Mr. Ley that the lesion appeared to be an ovarian molar pregnancy, so remarkably did it resemble the specimen published by Dr. Giles and myself in 1914.

Pathological Specimen.—This consists of the left Fallopian tube attached to the left ovary by its mesosalpinx. After hardening in Kaiserling-Pick's solution the following observations were made: Left tube measured 7 cm. in length and 1·2 cm. in diameter. To its outer coat were attached a few filmy adhesions. The abdominal ostium was closed, but the ampullary end was not dilated. The fimbriæ were indrawn, so that the tube ended in a depressed dimple. Attached to the abdominal end was a hydatid of Morgagni, and to this adhered some tags of adhesions resembling fimbriæ of the tube (*see* fig. 1). The mesosalpinx was translucent; it separated the tube from the ovary by a vertical distance of 1·7 cm. The left ovary with its contained hæmorrhagic cyst measured 7 cm. in its vertical and 4·8 cm. in its transverse

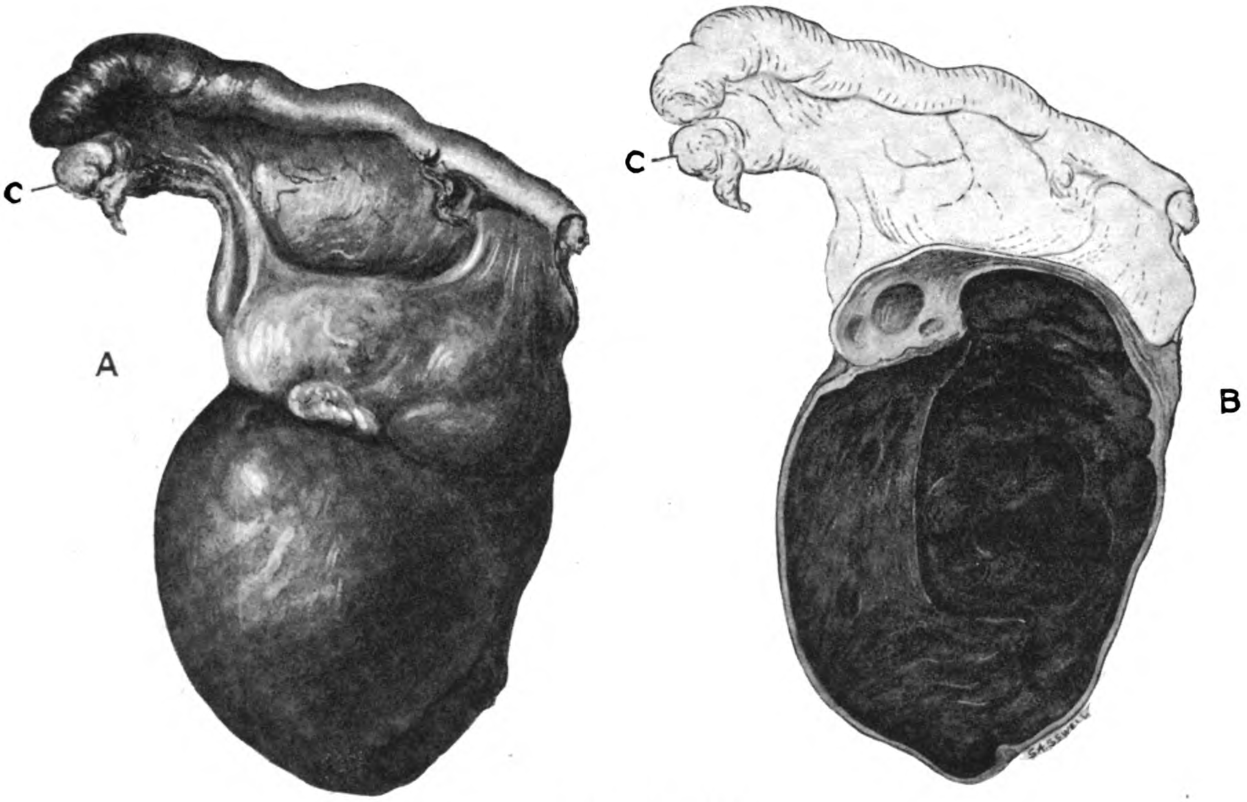

FIG. 1. (Case I.)

Primary ovarian pregnancy. **A**, posterior view of external aspect; **B**, mesial section through ovary and gestation sac; **C**, hydatid of Morgagni with adhesions. (Natural size.)

diameter. It is divisible into an upper (apparently) solid portion measuring 2·5 cm. by 4·3 cm. and a lower cystic portion measuring 4·5 cm. by 4·8 cm. These two portions are sharply demarcated by a constriction, or waist, so that the cystic lower portion fits into the upper solid part like an inverted acorn in its involucre (*see* fig. 1, A). On bisection of the ovary, what had appeared to be solid ovarian tissue was hollowed out centrally, due to invasion thereof by the blood-cyst situated below. By hardening, the hæmorrhagic contents of this cyst had become a firm laminated clot in which were several irregular crevices due to shrinkage (*see* fig. 1, B). The ovarian stroma which capped the clot presented several atresic follicles, but no yellow tissue was seen on cross-section. The capsule of the clot was not ruptured, it consisted of compressed ovarian stroma which, in thickness, measured from 0·2 cm. at its upper pole (where it was attached to the mesosalpinx) to 0·1 cm. at its lower free pole. Sections of the tube showed evidence of a mild degree

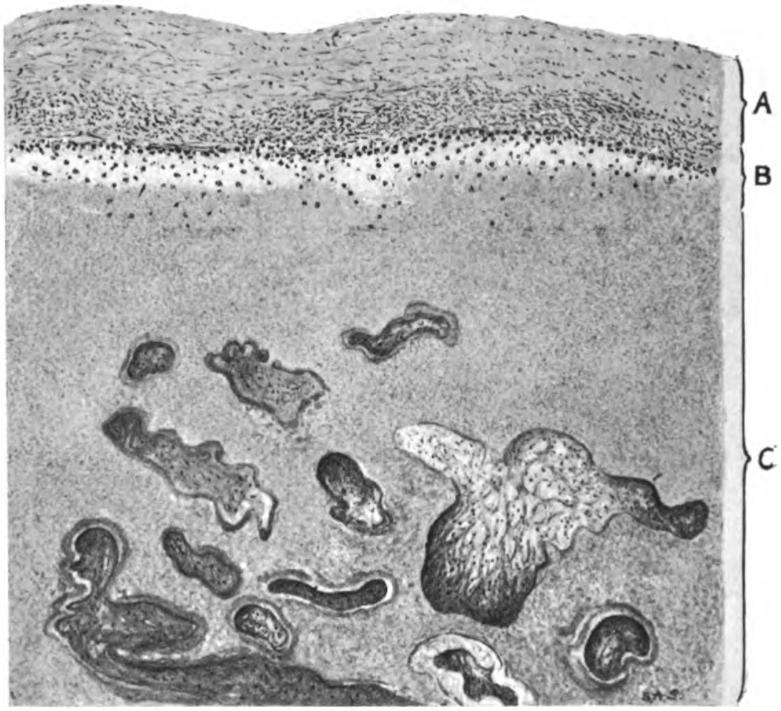

FIG. 2. (Case I.)

A, ovarian cortex ; **B**, degenerate lutein cells ; **C**, ovarian molar pregnancy (× 105.)

of chronic salpingitis (shown by epidiascope), the plicæ were swollen, but were not adherent at their tips; there were no pseudo-follicles and no invasion of the musculature by mucosal epithelium. On the uncovered (lower) aspect of the tube the vessels were dilated and engorged. There was no evidence of fœtal tissue to be seen anywhere. Many sections of the ovary were cut and stained with logwood and eosin and also by van Gieson's method. Those taken from the lower pole of the blood-clot showed nothing of importance excepting the fact that the capsule consisted of ovarian tissue. Those from the upper half were more interesting. They showed (1) that the ovarian stroma contained (*a*) numerous dilated and thrombosed blood-vessels, (*b*) that as the blood-clot was approached the stroma became degenerate, but still clearly demonstrated the presence of layers of lutein cells intermingled with fibrinous material (*see* fig. 2, A and B). (2) Within the clot were seen chorionic villi for the most part very degenerated but showing, in some cases, strands of trophoblast bounding a fibrous core (*see* fig. 2, C). These findings clearly prove this to be a primary ovarian pregnancy which has resulted in the formation of an unruptured ovarian mole.

CASE II.

E. P., married, aged 33. The patient was sent to me on April 9, 1916, by Dr. Hugo, who kindly supplied the following notes: "Seen on June 17, 1915. Previous history" (taken in 1915, ten months before I saw the patient): "Three children, youngest aged 5, and one miscarriage three years ago, since when the periods have been regular. Present attack (June, 1915): Last night, after getting into bed at 11 p.m., the patient was seized with very acute pain in the right iliac region shooting into the leg, which caused her to draw up the leg to obtain relief. It was described as 'worse than having a baby.' The last period was five weeks ago, that is, she was one week overdue. The last 'period' was preceded by the passage of clots. The pain lasted all night, but the patient got up this morning, though feeling very ill on account of pain. There had been a slight show yesterday, i.e., June 16. There was no retching nor vomiting, the bowels were regular, pulse and temperature normal. Bowels opened this morning without influencing the pain. No pain on passing water. Examination: No limitation of respiratory movements of abdomen. Tenderness on pressure over right iliac region. *Per vaginam* considerable tenderness. Ring pessary removed. Uterus retroflexed, fundus enlarged and tender. In the right broad ligament a very tender swelling could be felt. I wished her to go to the Cottage Hospital for operation, but she would not consent, so I treated her at home, keeping her in bed until the end of July, 1915, by which time all acute symptoms had subsided. On March 11, 1916, the patient had a subacute attack, after which I persuaded her to go and see you. She gives a history of having had rheumatic fever which affected her heart."

On admission to the Samaritan Hospital on April 9, 1916, the patient said that she was seized with abdominal pain five weeks ago. The pain affected chiefly the right side, and was accompanied by irregular bleeding. She stated that her periods had been regular until the last attack of pain. Temperature 99·4° F., pulse 88. Heart and lungs normal. *Per abdomen* some resistance in the right iliac region. *Per vaginam* cervix forwards, uterus retroverted, tender and fixed. Appendages thickened on both sides. A mass the size of a tangerine orange to the right of the uterus. Left ovary slightly enlarged. Diagnosis : "Fixed retroversion, double salpingo-oöphoritis, ? right-sided pyosalpinx."

Laparotomy, April 19, 1916, assisted by the Matron, present Mr. Malcolm. There was no free blood in the peritoneal cavity. To the right of the uterus lay an enlarged ovary, which was adherent in the right posterior quarter of the pelvis, but which was brought up without difficulty. I showed it to Mr. Malcolm, who was looking on, and expressed the opinion to him that it would prove to be an ovarian gestation. The uterus was not adherent as was previously thought. The left ovary was cystic, and its lower half, containing two cysts, was resected. Both Fallopian tubes appeared to be quite normal. The right tube and enlarged right ovary were removed.

Pathological Specimen.—This consists of the right Fallopian tube, mesosalpinx and right ovary, and also the lower half of the left ovary. The tube is somewhat thickened and tortuous (*see* fig. 3, U). Its ostium is patent and the fimbriæ free and somewhat succulent. The tubal segment measures 5 cm. in length and is 1·2 cm. in diameter at its ampullary portion, 1 cm. in diameter through the isthmic part. The mesosalpinx is contracted but translucent; along its outer margin (infundibulo-pelvic fold) runs the ovarian fimbria to the surface of the ovary. The maximum vertical measurement of the mesosalpinx is 1·5 cm. The ovary measures 5 cm. by 4 cm. The upper part (2 cm. by 3 cm.) is comprised of solid ovarian tissue which caps, or overlies, the lower segment (3 cm. by 4 cm.), which consists of a blood-cyst (*see* fig. 3, A). The latter is very sharply differentiated from the former, not only by its colour and by the smoothness of its capsule, as compared with the furrowed pale surface of the solid part of the ovary above it, but also, by the fact that a demarcating sulcus separates the solid from the cystic part. On hemisection, after hardening in preservative, the upper solid stroma presents numerous corpora albicantia, and an atresic follicle 1 cm. in diameter. The cystic portion is enclosed in a capsule made up of ovarian stroma which shows no sign of having ruptured. On microscopic examination the conditions revealed are very similar to those of Case I—i.e., the ovarian stroma shows numerous dilated and engorged blood-vessels (*see* fig. 4, A) which lie outside a necrotic zone in which the remains of a ripe corpus luteum are still visible—but here and there is seen a definite invasion of ovarian stroma by chorionic villi, one of which appears within a blood-vessel as an instance of "verschleppung." Within the clot itself is seen the lining of the chorio-amniotic sac with large branching villi proceeding from the chorionic membrane (shown by epidiascope), but no fœtus could be found.

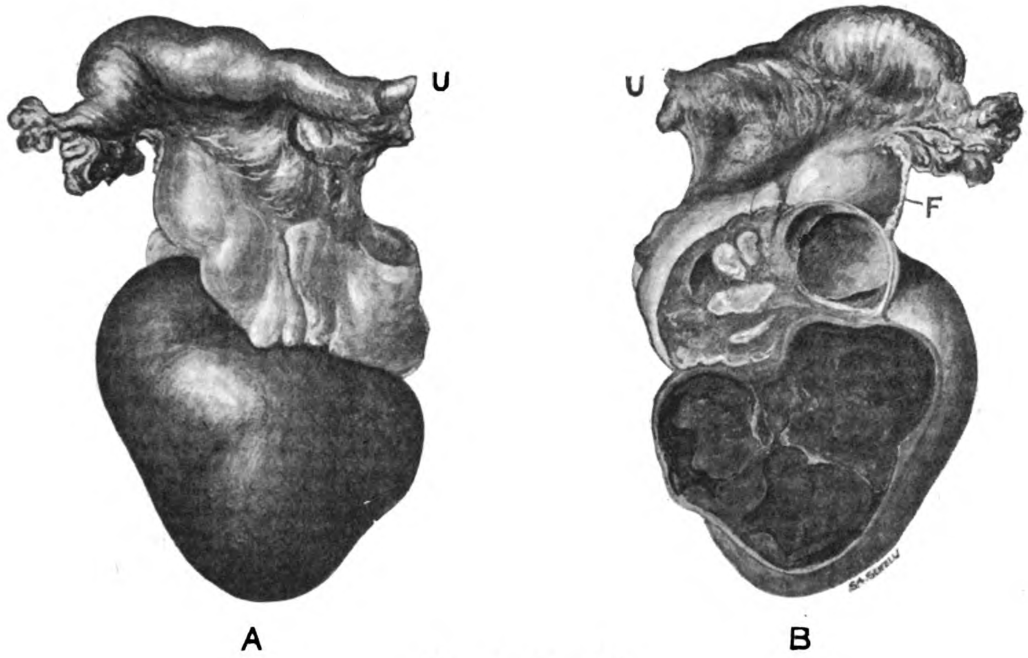

FIG. 3. (Case II.)

Primary ovarian pregnancy. **A**, anterior view of external aspect; **B**, mesial section through ovary and gestation sac; **U**, uterine end of tube; **F**, ovarian fimbria. (Natural size.)

The gestation sac and the escaped blood are enclosed in a cyst, the inner lining of which is composed of degenerate lutein cells (*see* fig. 4, B). The villi are old and degenerate (fig. 4, C), but some of them still show the remains of a syncytial investment. Section of the Fallopian tube

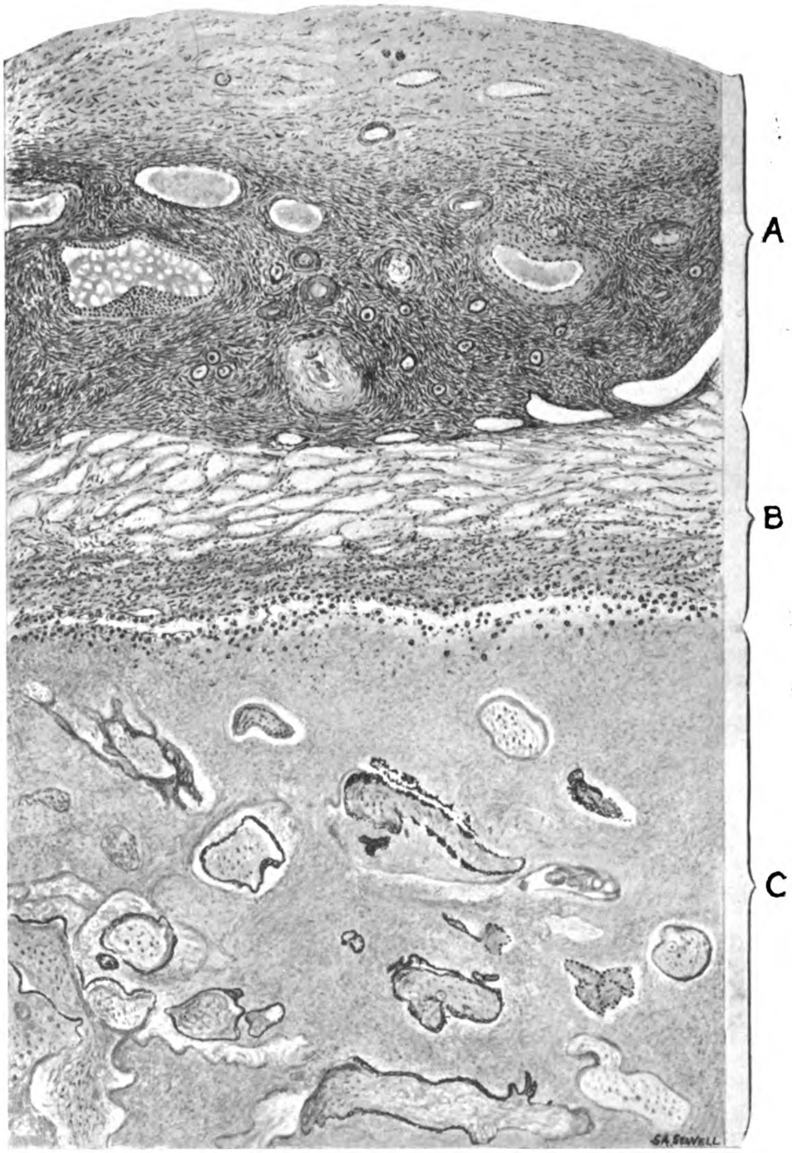

FIG. 4. (Case II.)

A, cortex of ovary; **B**, wall of corpus luteum; **C**, ovarian molar pregnancy. (× 105.)

showed no evidence of mucosal inflammation; there was some œdema of the muscular coat, otherwise the tube was normal (shown by epidiascope).

It is an interesting fact that this patient gave birth to a full-term child in March, 1917, eleven months after the removal of the right ovarian pregnancy, because, as previously stated, one half of the opposite ovary was resected on account of its cystic condition.

SERIES I.—ACCEPTED CASES.

1910.

BARROWS, C. C. "Ruptured Ovarian Pregnancy," *American Journal of Obstetrics*, New York, 1910, lxii, pp. 1078-1081.

Patient married, aged 25. Menstruation irregular for eight months; not excessive, no clots, no membrane. No pain. No change in breasts. Admitted September 26, 1910. Twenty-four hours before admission she became nauseated and fainted after lifting a heavy tub. Severe pain in lower abdomen. Ruptured tubal gestation diagnosed. Abdominal cavity full of fluid blood and a few clots. Both tubes and left ovary were normal. Lying below the right tube was the ovary the size of a large walnut. There was a rupture of the ovarian wall and protruding from this was a clot. Report of A. J. Elsen, of Cornell University Medical College: "Specimen N3,678 consists of a tube and a portion of ovary, also a blood-clot, which is irregularly spherical in shape, about the size of a walnut. The clot appears to be partially surrounded by a capsule and at one point it shows tissue closely resembling placental structure. The tube is normal in size and appearance. Microscopical examination reveals numerous chorionic villi. The capsule surrounding the blood-clot shows that it is made up of ovarian structures. Diagnosis: Genuine ovarian pregnancy."

LEA, A. W. W. "A Case of Ovarian Pregnancy with Diffuse Intraperitoneal Hæmorrhage," *Journal of Obstetrics and Gynæcology of the British Empire*, 1910, xviii, pp. 182-187 (three coloured plates).

Patient, aged 29, married two years. On December 31, 1901, she was seized with severe abdominal pain, vomiting and faintness. Extreme pallor. Menstruation normal, last period three weeks previously, no vaginal hæmorrhage. Indistinct fullness in pouch of Douglas. Large quantity of blood in abdomen. Tubes normal. Left ovary contained a thin walled blood-cyst which had ruptured and collapsed. The greater part of the ovary was normal, but a portion of the cortex was expanded to form the investment of a coagulum. The latter contained chorionic villi. Sections of tube showed it to be normal. Section of the ovary showed dilatation of blood-vessels, hæmorrhage in the stroma and a moderately thick layer of lutein cells. In the wall of the blood-cyst were corpora albicantia and a Graafian follicle.

TWEEDY, E. HASTINGS. *St. Bartholomew's Hospital Reports* (1910), 1911, xlvi, p. 249.

The clinical report reads: "Ovarian pregnancy removed by operation from a woman who had borne three children and had aborted once. Her youngest child was born in June, 1909. On September 8 following she menstruated once, but there was no further loss. On November 5, seven weeks after the last menstrual period, she was seized with acute pain in the right hypogastric region. Examination revealed a tender mass the size of a hen's egg, lying to the right of a retroverted uterus, and a diagnosis was made of extra-uterine pregnancy. The patient refused treatment at the time, but returned ten days later giving a history of continuous vaginal hæmorrhage and intermittent pain since her previous visit. On November 16 laparotomy was performed. Both Fallopian tubes, together with the left ovary, were found to be healthy. The right ovary was obscured by a blood-clot attached to the ovarian ligament on this side. It was removed in its entirety, the tube which ran above it being left intact." St. Bartholomew's Hospital Museum report, No. 3,077, E: "Part of an ovary showing the effects of an ovarian pregnancy. In the recent state the specimen was an elliptical mass measuring 3 in. in its long diameter. This mass has been longitudinally divided and is seen to consist of two parts, a small area of dense tissue surrounded on three sides by blood-clot. The dense tissue again falls into two subdivisions. The greater part of it has the appearance of connective tissue, and contains blood-vessels visible to the naked eye; but at its lower extremity, as seen in the preparation, it is separated from the mass of blood-clot by a narrow tapering band of a yellower material. This last is a corpus luteum. Into it occurred the bleeding which subsequently ruptured the ovary and produced the enveloping clot. Microscopic examination shows that the dense tissue is ovarian stroma and the tapering band corpus luteum. No chorionic villi can be seen, but sections made from the other half of the specimen contain them in abundance." There is a good drawing in the *Proceedings of the Royal Society of Medicine*,[1] and the report of the Pathology Committee was confirmatory.

BONDI, JOSEF. *Wiener klinische Wochenschrift*, 1910, p. 774.

Patient, aged 22, married February 10, 1909. Period on February 25, also on March 25. Period missed in April. May 19: Severe hæmorrhage for four days; thought to be an abortion by family doctor. June 9: More hæmorrhage; no marked pain. Admitted on June 20 (operation June 21). Behind the uterus on the right side was a movable sensitive tumour the size of a fist; a rounded cord running over the tumour was felt. Operation, June 21:

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[1] *Proc. Roy. Soc. Med.*, 1910, iii (Sect. Obst. and Gyn.), p. 132.

Omental adhesion easily separated, no escaped blood. Right ovarian tumour held by loose adhesions. Opposite adnexa: Left tube very tortuous and short. Left ovary small, no corpus luteum. The specimen consisted of the right tube and ovary; right tube tortuous, but it was normal microscopically; its fimbriæ were free. The ovary was the size of an orange; its outer surface showed adhesions. On section a cavity the size of a nut was found in the middle of the ovary. Attached to its wall was a portion of umbilical cord 5 mm. long and a fœtus 7 mm. in length. Microscopically the walls of the cavity showed no tissue characteristic of a Graafian follicle. The inner layers of the cavity consisted of the amnion and chorion. Two good drawings.

1911.

HOLLAND, EARDLEY. "A Case of Ovarian Pregnancy, probably Bilateral," *Journal of Obstetrics and Gynæcology of the British Empire*, 1911, xx, pp. 295-298.

Patient, aged 40, married twelve years. No children, one miscarriage some years previously. Admitted in March, 1909. In October, 1908, after six weeks amenorrhœa, abdominal pain and uterine bleeding. Menstruation regular during December, January, February. March 6: Another "attack." Diagnosed as ectopic pregnancy. Recent clot in pelvis; right ovary enlarged and adherent; it bled freely when drawn up. The left ovary was not enlarged, but on its posterior surface was an oozing rent with a small clot protruding. On section of the right ovary it was seen that a capsule of ovarian tissue enclosed a blood-clot, in the centre of which lay a gestation sac enclosed by chorionic membrane and an incomplete amnion. The amnio-chorionic stalk united it to the chorionic membrane. Remnants of trophoblast on membrane. No villi, no embryo. Left ovary: Curious "plasmoidal" cells found on section of projecting clot; ? nature.

YOUNG, E. B., and RHEA, L. J. "Ovarian Pregnancy: Report of a Case." *Boston Medical and Surgical Journal*, 1911, clxiv, p. 264.

Patient, aged 27, single. Catamenia regular before present illness. Sent to Young in October, 1908, as a probable case of fibrosis. Present illness (February, 1908): Menorrhagia; curetted, but loss continued until the end of September. Vaginal examination: Slight bloody discharge, uterus retroverted, tubes somewhat adherent, and an enlarged left ovary. The appendages and uterus were quite movable, and the old inflammatory process seemed quiescent. Ovarian cyst diagnosed. Operation: Extensive old pelvic inflammation; when adhesions were separated recent blood-clot was found in left side of pelvis; it completely surrounded the ovary. Fimbriated end of the left tube closed, and adherent to bottom of pelvis; the rest of the tube was free except for slight adhesions to bowel. Section of the left ovary after hardening in 10 per cent. formalin revealed a small embryo "lying in a rounded space"

(Young). A very convincing pathological report is furnished by Rhea, who describes the microscopic finding of chorionic villi and dilated blood-vessels in the ovarian stroma, but he does not refer to the embryo mentioned as being found by Young, who had incised the ovary some time previously in the presence of Dr. H. C. Low (pathologist). The only criticism I would offer is that the tube was unfortunately very close to that part of the ovary which illustrates the presence of villi, as seen in micro-section No. 1, but the lumen of the tube shown in the same section appears normal.

1912.

BANKS, A. G. "A Case of Ovarian Pregnancy," *Journal of Obstetrics and Gynæcology of the British Empire*, 1912, xxi, pp. 216-219.

Patient, aged 24, married five years. Two children, younger aged 2. Admitted for hæmorrhage of six weeks' duration. *No period had ever been missed.* Last period ceased on October 7. October 24: Hæmorrhage without pain continued daily for one month. November 11: The first of three attacks of severe pain occurred. Admitted on November 27 with labour-like pain and increased hæmorrhage. In Douglas's pouch, to the right, was a tender doughy mass, the size of a Seville orange. Right tubal pregnancy diagnosed. Not more than *half an ounce of fluid* blood in peritoneal cavity. Tumour easily brought to view; one or two thread-like adhesions. Tumour was ovarian, its tube was normal. Oöphorectomy, with segment of ovarian tissue retained. Recovery. Ovary contained a fœtus (good drawing shown) of about eleven weeks' development. The cord was attached to the thinned-out free lower pole of the cyst—i.e., the part opposite to the main solid mass of ovarian tissue. No "decidual reaction" in the ovary, but some multinucleated masses seen in the stroma: these were probably of trophoblastic origin. The villi present were old and degenerate.

GRAHAM, G. S. "A Case of Ovarian Pregnancy," *Journal of Medical Research*, 1912-13, xxvi, pp. 499-512.

Graham, as assistant professor of pathology in the Dartmouth Medical College, met with this specimen in the laboratory. Who the surgeon was is not stated. The patient, aged 36, was a 2-para; the younger child was born four years ago. No miscarriages. Menstruation regular until a month ago, since when constant menorrhagia. A little more than a month ago there was a severe attack of right-sided abdominal pain, and vomiting; the attack lasted four days. *Per vaginam* a small tumour palpable in region of left ovary. Left tube and ovary and appendix removed. Recovery. Laboratory report: "The specimen consists of an ovary with its Fallopian tube. The tube measures about 5 cm. in length, and about 0·5 cm. in its greatest diameter. Beyond an injection of the superficial blood-vessels no evidence of pathological change can be determined. The fimbriated end is patent. The ovary is about the size of a hen's egg, reddish in colour, and rather soft. Its surface is irregularly furrowed or lobulated, and appears free from adhesions. Section reveals a cavity about 1·5 cm. in diameter placed excentrically within the ovarian mass, and bounded by a thin white membranous wall of rather firm consistence. The tissue around this cavity is soft, reddish in colour, and strongly suggests placental tissue. In its thicker portion is a corpus luteum, which borders upon the soft reddish mass and appears to be blended with it." Microscopic description: The Fallopian tube — Most careful description by the author shows that there was no evidence of old or recent inflammation. The ovary —Outer zone of typical ovarian tissue, then a "transition-zone" bounding a third innermost zone, within which were numerous chorionic villi, with intervillous spaces containing red disks, fibrin, trophoblast-elements, and leucocytes. The inner margin of this zone is defined by the fœtal membranes.

The paper is an admirable piece of histological work, and the theories as to how the impregnated ovum secures implantation in the ovary are well debated.

LENDON, A. A. (Lecturer on Obstetrics, University, Adelaide). *Australasian Medical Gazette*, 1912, xxxi, p. 492.

Lendon's article (which appears in the above gazette on the next page to Verco's) begins with the statement that he (Lendon) does not think that any genuine cases of ovarian pregnancy have yet been published in South Australia, and he proceeds to mention a case of Rothwell Adam, of Melbourne, but does not refer to Verco's case; perhaps exception was taken to the latter on the ground that no histological facts were forthcoming.

Dr. Lendon's case: Patient, 1-para, aged 25, married one year nine months. Partus on April 11, 1911; last menstruation, September 8 to 12. Pain in lower abdomen after defæcation was complained of on October 20. On October 29 the patient fainted. Examination revealed a swelling in Douglas's pouch. Dr. de Crespigny has, though at first reluctantly, conceded that it (the specimen) fulfils all the postulates of a true ovarian pregnancy. He writes: "The specimen consists of the left Fallopian tube, the ovary, and a part of the broad ligament. The tube is quite free from adhesions; it is slightly hyperplastic, but shows no sign of pregnancy, either macroscopically or microscopically. The ovary is considerably enlarged, white and tough. Adherent to its outer aspect and partly infiltrating its tissue, is a mass about 5 cm. by 2 cm. by 3 cm., with a rough, shaggy surface and a rather friable, reddish texture, apparently consisting mainly of blood-clot. After hardening, an incision was made through this mass and continued so as to hemisect the ovary. That the mass partly invaded the ovary was evident. Furthermore, a recent corpus luteum is present in the ovary, and instead of being in the form of a ring, the yellow layer of the corpus luteum is a curved line partly enclosing the pregnancy and separating it from the rest of the ovary. The appearance is as though the corpus luteum were ruptured by the growth of its contents. Microscopic examination shows this mass to consist of chorionic villi invading blood-clot. There are also dilated venous spaces such as are found in the pregnant uterus. The fœtus was not seen."

VERCO, W. A. "Ovarian Pregnancy," *Australasian Medical Gazette*, 1912, xxxi, p. 491.

The author gives a brief history of the subject, then relates a case of ovarian pregnancy. The patient, aged 32, was a 3-para. Pain in the lower abdomen was thought at first to be due to appendicitis, but the history of a period being four to five days late raised the possibility of an extra-uterine fœtation. At operation there was found a blood-stained discoloration of the omentum. No decidual cast. The right ovary was nearly as large as a turkey's egg, and "had hæmorrhage into its substance." There was no twisting of its pedicle to account for this. The right ovary was removed, but its Fallopian tube, being healthy, was retained. The left ovary and tube were healthy. On incising the ovary "a small fœtus was seen in a cavity occupying the centre of the ovary and was hanging by the tiny umbilical cord attached to the placenta." There is no histological record.

In this case there was probable bleeding into the ovary during the fourth week of pregnancy, when the first attack of pain occurred. Size of fœtus not given.

1913.

CHIENE, GEORGE. "Ruptured very early Primary Ovarian Pregnancy." *Obstetrical Transactions*, Edinburgh, 1913, xxxviii, p. 96.

Patient, married, aged 34, 6-para; youngest child aged 2½. Admitted as a case of acute appendicitis requiring immediate operation. Menstruation quite regular, expected next period three days after admission. Temperature 99·4° F., pulse 120. Pain, especially in right iliac fossa and through to back. There was no vaginal hæmorrhage. *Per rectum* distinct fullness in pouch of Douglas. Fainting attacks shortly before admission. Peritoneal cavity full of blood. Right tube normal. Bulging mass size of a cherry protruded from inner pole of right ovary 2½ in. away from fimbriated end of the tube (good coloured drawing of this). The ovary was removed but not the tube. Left tube and ovary normal. Appendix normal. Photomicrograph shows ovum lying completely surrounded by ovarian stroma.

GRIMSDALE, T. B. "Case of Ovarian Pregnancy with Full-time Fœtus." *Journal of Obstetrics and Gynæcology of the British Empire*, 1913, xxiii, pp. 115-117.

Patient, aged 22, married three years, 3-para. Admitted on February 19, 1912, with abdominal swelling of three years' duration. Last confinement two months before admission. Says she "never became small" after her first child was born. No pain, except at times on micturition. Mobile mass reaching to umbilicus, not tender; uterus lay to the right of tumour and free from it. Solid ovarian tumour diagnosed. At operation: Tumour freely movable and its relations clearly demonstrated. It was delivered whole through the abdominal wound and was then seen to be the left ovary with its tube and mesosalpinx quite normal. The left round ligament was seen to arise from the left horn of the uterus and to lie well to the right of the tumour proving that it was not an ill-developed left horn of the uterus. The left ovarian tumour contained a fœtus and a placenta. X-rays established that the fœtus had reached full term. *No history of amenorrhœa* apart from that relating to the two uterine pregnancies. No history of pain to suggest rupture of the sac with hæmorrhage at any time or a spurious labour.

The case appears to be one of coincident ovarian and uterine pregnancy.

HANNES, W. "Ovarian-Gravidität," *Zeitschrift für Geburtsh. und Gynäkologie*, 1912, lxxii, pp. 269-271.

This is a well illustrated account of primary ovarian gestation with five coloured pictures (one macro- and three microscopic drawings). The patient was a 3-para, aged 27. The last period was on January 21 to 25, 1912. A fortnight later hæmorrhage, which lasted for a week, set in. It ceased for a week and occurred again lasting three to five days; it was accompanied with pain in abdomen and spine. Admitted on March 9, 1912. Uterus elevated and anteposed. Behind the uterus was a tumour the size of a small fist, filling up the pouch of Douglas and connected with the right adnexa. Tubal gestation diagnosed. The abdomen contained a fair amount of dark fluid and clotted blood. The right tube was empty and its fimbriated end "free." The swelling was ovarian. Recovery. The tube was quite separate and distinct from the ovary. The latter on section showed a small amniotic sac containing a tiny fœtus. The sac was surrounded with clot which in its turn was encapsuled by ovarian tissue. Blood-clot and penetrating villi were present in the stroma. A Graafian follicle is depicted, but no ripe corpus luteum was present.

MCCANN, F. J. "Primary Ovarian Pregnancy at the Fourth Month," *Proceedings of the Royal Society of Medicine*, 1913, vi (Section of Obstetrics and Gynæcology), p. 229.

Patient, aged 32, mother of one child, aged 5½. Regular periods ceased on February 10, 1912; subsequently acute attacks of pain and vomiting on left side of lower abdomen. Large cystic tender swelling up to umbilicus. Enlarged uterus in front and to right. Diagnosis: Cyst of ovary complicating early pregnancy or ectopic gestation. Old blood-clot in lower abdomen. Tumour was a left ovarian cyst, its Fallopian tube was normal. The ovarian cyst consisted of two loculi, containing adenomatous growth; separated from these by a septum (containing other small cystic cavities showing adenomatous tissue) was a third cavity 4 in. in diameter; in the latter was a fœtus and placenta of about four months' development. A good drawing is shown.

MALL, F. P.; CULLEN, E. K. "An Ovarian Pregnancy located in the Graafian Follicle," *Surgery, Gynæcology, and Obstetrics*, 1913, xvii, pp. 698-703.

Patient, aged 24, was admitted on June 1, 1910, with diagnosis of appendicitis. Paroxysms of pain, general throughout the abdomen, more acute on left side, worse on movement, occasional vomiting. Abdomen filled with blood; both tubes intact; right ovary swollen and bleeding. Finney, the operator, said: "The whole process was so definitely confined to the ovary that it seemed clinically to be a definite case of ovarian pregnancy." Recovery. Specimen: Tube and ovary from right side. Tube somewhat tortuous, few adhesions on the surface; mucosa somewhat thickened and blood-tinged. No gross evidence of a tubal pregnancy. Mucosa normal in microscopic sections. Ovary measures 5 cm. by 4 cm. by 3½ cm. Few old adhesions on surface. Transverse section through the ovary at the point of rupture of the follicle is shown in a drawing by Max Brodel. It shows a central cyst containing a clot. This clot was covered by an inverted chorion and contained villi. The cyst was lined by yellow lutein cells. The authors say it shows conclusively that the ovum had lodged itself in a Graafian follicle, undoubtedly the one from which it came, indicating that the sperm must have entered the follicle after it had ruptured. The fertilized ovum then found lodgment in the follicle, around which a corpus luteum developed.

OLDFIELD, C. "Ovarian Gestation," *Journal of Obstetrics and Gynæcology of the British Empire*, 1913, xxiii, pp. 41, 42 (2 plates).

Patient, aged 37, married twelve years; no previous pregnancy; no previous menstrual irregularity. In May, 1912, when the period was seventeen days late, sudden pain and vaginal hæmorrhage. June 24: Fainted in bed, but no pain. Hæmorrhage started again, lasting three to four days. June 26: Fragments of decidua passed. Abdomen not tender, fullness in posterior fornix. Under anæsthesia: Left ovary a little larger than usual. Dark fluid blood in abdomen and clots; amongst these a mole was found. Left tube and ovary removed. Right appendages normal. Left tube normal. Left ovary a little larger than usual, presented a saucer-shaped depression from which blood oozed; deep to this, the ovarian tissue contained large blood-sinuses as in an early uterine pregnancy; amongst them, in the stroma, was a chorionic villus, and Nitabuch's fibrin-layer between fœtal and maternal structures was demonstrated "so that there is no doubt it was on this surface that the ovum was implanted." The mole contained an amniotic sac with the blastoderm extruded and lying attached to the surface of the mole.

SENCERT, L., and ARON, M. "Une curieuse observation de grossesse ovarienne," *Bulletin de la Société d'Obstétrique et de Gynécologie de Paris*, 1913, ii, pp. 830-835.

Patient, aged 23, the wife of a colleague. Married in February, 1911; thought to be pregnant in April: only a slight show after this, but much abdominal pain, especially in the left iliac region. The left fornix was tender, but no swelling was felt. Later, the left ovary was found to be enlarged. Patient demanded operation because of continuous pain. Laparotomy June 23, 1913: The left ovary was the size of a fresh walnut (noix fraiche) and dark in colour, and evidently very "altered." Uterus small. Right appendages normal in form but somewhat atrophic. The left ovary was removed; it was the size of a "mandarin," hard and irregular. At its larger pole was a rounded swelling, 2 cm. in diameter, like a corpus luteum, but in its centre was attached a yellow stalk 5 mm. long, 1 mm. thick. This proved to be an umbilical cord (mucous tissue, one artery and two veins), and the swelling in the ovary was proved microscopically to be placental tissue. A full account of the histology of this case is given, and although the tube was not removed there can be no doubt about the site of the embedding being in the ovary. No fœtus was found.

In the *Revue de Gynécologie*, 1914-15, xxiii, pp. 1-16, there are several interesting drawings and diagrams illustrating the features of the placenta in the above case. They show that the peripheral zone of insertion is occupied by a network of plasmodi-trophoblast to which the authors give the name of "Ectoplacenta." Outside this network are large blood spaces in the ovarian tissue, whilst the lacunæ between the plasmoidal tissue are filled with maternal blood. The embedding, therefore, shows the appearances which are now known to be typical in cases of normal intra-uterine pregnancy of about the second week, as seen in the Teacher-Bryce ovum.

1914.

CATURANI, M. "Ovarian Pregnancy with Report of a Case," *American Journal of Obstetrics*, 1914, lxix, pp. 409-428.

Patient, aged 30, married twelve years; three children, the last five years ago; five abortions, the last four years ago. Infected with syphilis and gonorrhœa. Acute attack of gonorrhœa fifteen months before first ectopic pregnancy. In June, 1909, Caturani operated for right tubal pregnancy. The tube and ovary of right side were removed. In January, 1912, missed her period for a few days. On January 10 severe abdominal pain and a show of blood. On January 24 abdomen distended and tender but no mass felt. *Per vaginam* mass to left of uterus. Slight dark bloody discharge. Operation fifteen days after initial attack. Abdomen contained fluid and clotted blood, no distinct hæmatocele. Fimbriated end of tube open. No trace of rupture in the tube. The ovary on its distal pole was apparently damaged and covered with clotted blood. The tube was removed, and with it almost a third of left ovary (i.e., the distal pole) was resected. At the operation the case was regarded as a tubal abortion and an ovarian hæmatoma from rupture at the site of a follicle. The real nature of the specimen was not found until microscopical examination was made. Gross specimen: This is made up of the left tube and part of the left ovary still attached to the tube by a slight band of tissue. The tube is 7 cm. long. No marked enlargement, no kinks, no traces of rupture. The ampulla was thickened and hard. The fimbriated extremity was free from adhesions, but traces of blood were found adherent to some fimbriæ and to the external surface of the tube. Microscope revealed chronic salpingitis at ampullary part, but no evidence of fœtal elements. A thorough microscopic investigation of the resected ovarian segment was made and a full account is given. The central area was composed of blood, fibrin, and chorionic villi. There was an "attempt at decidual formation along the margin of the ovum"—i.e., in the boundary between the fœtal and ovarian tissues. The fœtal elements lay in intimate relation to a corpus luteum, which Caturani says might be regarded as a proof of the embedding of the ovum in the follicle. Eleven cases out of nineteen reported by Norris showed relation of ovum to corpus luteum.

Caturani attributes the causation of ovarian gestation to peri-oöphoritis. He may be right, but his arguments are very theoretical. Thirteen figures help to explain the text.

GILES, A. E., and LOCKYER, C. "A Case of Ovarian Pregnancy." *Proceedings of the Royal Society of Medicine*, 1914-15, viii (Section of Obstetrics and Gynæcology), pp. 2-10.

Patient, aged 32, married four years; no children. Consultation in June, 1906, to ascertain cause of sterility. Good health; menstruation regular, except that a period was missed six months before consultation. Uterus normal in size and position. Rounded swelling the size of a duck's egg to right of uterus. Tumour was an unruptured ovarian hæmatoma of the right side. Right tube normal. Hæmatoma contained a large chorio-amniotic sac and many chorionic villi. No embryo found. No corpus luteum. Ovarian stroma contained many large engorged blood-vessels and showed decidual reaction in the medulla and cortex.

KÖHLER, ROBERT. *Gynäkologische Rundschau*, 1914, viii, pp. 275-280.

Patient aged 43. In the abdomen fluid and clotted blood was found. Both Fallopian tubes were unaltered. Fimbrial ends of tubes "free." The left ovary was normal. The right ovary was enlarged. On its median pole was a blue cystic swelling (cf. Chiene's case, p. 172). The right adnexa were removed. Recovery. The microscopic diagnosis was follicular gestation. No embryo was found, but chorionic villi were present in the cavity of the corpus luteum. There were lutein cells in the sac wall in contact with the ovum. No infantilism, no abnormal shortening or tortuosity or lengthening or inflammation of the tube.

SERIES II.

For various reasons the following cases are not included in the above list; in many the evidence that they are cases of primary ovarian gestation is inconclusive, in others no histological proof is forthcoming. Whilst some cases may be genuine, only short reports have been at my command, and from these it is impossible to come to any conclusion one way or the other.

1910.

The Cases of Balleray, Prince, and Rubin.

BALLERAY, G. H. *Medical Record*, July 2, 1914, p. 40.

Patient married ten years; no previous pregnancy. Period two weeks overdue, then irregular discharge. Pain in lower abdomen. Abdominal distension and vomiting. At operation a mass containing a four months fœtus was removed. " Outside the mass was made up of ovarian tissue " (?).

PRINCE, E. M. *Alabama Medical Journal*, Birmingham, 1910, xxii, pp. 751-754.

Patient aged 35. Illness began in June, 1907. Thought to be pregnant. Movements of child very violent on November 7, also uterine hæmorrhage. The same happened in February, 1908, and pieces of " flesh " passed. March, 1908: " Severe chill " and pyrexia for forty-eight hours. Operation, April 30, 1909: A sac containing a dead child weighing 7½ lb. removed. Six " points " *approximately equidistant* on the sac were microscoped; they showed the remains of corpora lutea (corpora albicantia ?). J. S. McLester reported: " I feel justified in concluding from the presence of the above-mentioned structures that each specimen was taken from the ovary. The operator states that the corresponding (right) tube could be demonstrated as separate and distinct from the tumour. This fact does not appear in the drawing of the specimen. Further data needed."

RUBIN, Dr. I. C. " Specimen of Primary Ovarian Pregnancy," *Medical Record*, December 31, 1910, p. 1211.

Specimen shown at New York Academy of Medicine. Patient, aged 24, married three years; one child, aged 2. Last period seven weeks before admission. Two months before admission sharp pain in lower abdomen, especially on right side. On admission: Left of uterus was a tender mass the size of an orange; it was regarded as an ovary without having the usual hardness of this organ. Operation, July 28, 1910: Uterus normal in size. Left tube bent on itself and attached to enlarged ovarian mass. Latter fixed by soft adhesion to left broad ligament. Left ovary looked œdematous and presented at one portion a dark chocolate-brown irregular protruding surface, thought to be a corpus luteum. On delivery of left adnexa a plum-coloured mass the size of a hazel nut seen; it was apparently free in the pelvis. Tubes neither enlarged nor ruptured. Left ovary still attached to uterus by its proper ligaments; it was, therefore, regarded as the first seat of the pregnancy. Dr. Rubin said there was *positive evidence* of pregnancy in the ovarian stroma, that the tube on the same side was separate and distinct, and showed "no gross microscopic signs of pregnancy." The "mole" had been lost. No evidence of decidual formation in uterus. What the evidence of pregnancy was in the ovarian stroma is not stated, but Tilden Frank, in discussion, thought that the decidual cells were "stroma cells, the result of the hæmorrhagic condition."

1911.

KIVLIN, C. F. *Annals of Surgery*, 1911, liv, July-December, p. 206.

Patient, single, aged 21, Last period, April 12, 1908. Hæmorrhage, June 14 to 28. When admitted there was a mass the size of a large orange in left side of pelvis. Right side free; colostrum in breasts. Operation, June 28, 1908: Left salpingo-oöphorectomy. Right tube and ovary normal. Incision of right large ovary revealed an embryo of six weeks' development. Right tube "apparently normal, not attached to ovarian mass." "Ovarian mass" not adherent to any surrounding structures. Pathological report: Gestation sac contained ovarian tissue. Tube normal, no evidence of impregnation in the tube. No illustration, no means of testing the validity of statements. The author says every man should be given credit for a true diagnosis on his own personal observations!

PRAWOSSUD, TH. G. *Zentralblatt für Gynäkologie*, 1911, xxxv, p. 1230.

A nearly full-term ectopic pregnancy with a living child. Both Fallopian tubes normal. Left ovary wanting. The left tube ran over the gestation-sac. ? Ovarian pregnancy.

KUSMIN, S. J. "Zur Frage über extra-uterine Gravidität," *Zentralblatt für Gynäkologie*, 1912, xxxvi, p. 402.

In seventy-five cases of ectopic gestation there were two tubo-ovarian pregnancies and one ovarian. In the ovarian gestation the corresponding tube was unaltered. Ovarian tissue was not proved, and the patient was seven months pregnant with an intra-uterine gestation.

1913.

BENEKE. *Verhandlungen der Deutschen pathologischen Gesellschaft*, Tagung 16, 1913, p. 355.

Patient, aged 27; one child, aged 1½; one abortion. When menstruation was a week overdue there was sudden pain and fainting, followed a week later by hæmorrhage lasting three days. Operation: Salpingo-oöphorectomy. This purported to be a demonstration of ovarian pregnancy, but was, in fact, an example of embedding of the fertilized ovum in blood-clot situated between the tube and ovary. It is true that the coagulum overlay a corpus luteum of the ovary, and from this it was assumed that the clot came from the rupture of the follicle. There was no evidence, however, to show that the embedding was ever intra-ovarial. This case was also reported by Keil in the *Zentralblatt für Gynäkologie*, 1913, xxxvii, No. 13, p. 465.

ENGELKING, E. "Intra-ligamentär entwickelte Eierstocksschwangerschaft. Ein Beitrag zur anatomischen Diagnose vorgeschrittener Fälle." *Monatsschrift für Geburtshilfe und Gynäkologie*, 1913, xxxvii, pp. 740-756.

Patient, aged 33, 1-para; no abortions. Normal labour nine years after marriage when she was aged 30. Periods always regular. Came to clinic because of abdominal enlargement, noticed for ten months, with irregular hæmorrhage for the past fourteen days. Uterus anteflexed and fixed by a fluctuating tumour which filled the true pelvis and reached to the ribs. Clinical diagnosis: Ovarian tumour or ectopic gestation. The latter was made certain during operation; the sac was on the right side and adherent to the right ureter. In its transverse diameter the sac measured 52 cm.; it contained a macerated fœtus of eight months' development. The sac contained, although partly unrecognizable (wenn auch vielleicht teilweise unerkennbar): "Tube, ovary, lig. latum. and ovarii proprium," all enveloped in rough adhesions (operation took two and a quarter hours). The sac could not be tubal, as on examination the tube was found to be separated from the sac in one place by a lamella 3 cm. wide, thought to be the mesosalpinx; elsewhere it disappeared in the sac wall (geht also hier scheinbar in den Aufbau der Wand ein).

In the illustration the tube is indicated by a schematic dotted line which takes a tortuous course across the sac wall. The tube itself is nowhere apparent as such, and further the author says "das Abdominalende der Tube vollständig in der Fruchtsackwand aufgeht." In microscopic sections the closer they approached the end of the tube the nearer was the tubal epithelium to the placental tissue, the intervening connective tissue between the two being reduced to a tenth of a millimeter. The last remains of fimbriæ lost themselves in the connective tissue of the gestation sac. No ovarian tissue was found in the gestation sac; it contained muscle and was therefore not a peritoneal implantation. From serial sections of the tube the author excluded a tubal pregnancy, and from a fan-shaped dilatation of the tube as it lay on the outside of the sac he concludes a tubo-ovarian implantation. This fan-shaped dilatation of the tube I have myself shown in a secondary embedding of the gestation sac in omentum. It can be produced by tubal abortion. This case cannot be regarded as a primary ovarian pregnancy. (C. L.)

PAUCOT, H. DEBEYRE A. Étude sur les Grossesses ovariennes jeunes. *Annales de Gynécologie*, 2^e série, x, 1913, pp. 129-144.

A critical review based on seven cases in the literature and a description of a case of the author's. Tubal gestation was diagnosed in a single woman, aged 24. At operation the uterus was enlarged. Left cystic ovary and tube removed; no free hæmorrhage. The cyst contained blood. No torsion of appendages. After hardening, the ovary was found to contain a cavity 2 cm. in diameter resembling a corpus luteum of pregnancy, also a cavity containing a whitish membrane composed of "a sort of granulation tissue," and further some caseous looking material which microscopically resembled granulation tissue. The authors regarded this as "pathological vestiges of the amnion and the embryo."

ROUFFART, E. *Annales et Bulletin de la Société royale de Science médicale et naturelle de Bruxelles*, 1913, lxxi, pp. 232-235. "Hémorragie intra-péritonéale par rupture spontanée d'une grossesse de l'ovarie." *Journal belge de Gynécologie et d'Obstétrique*, 1re an, January, 1914, No. 1, pp. 46-49.

Patient underwent Alexander-Adams operation in February, 1913. After this the periods were regular until August. Five days late in September, irregular bleeding followed, and "*crise douloureuse*" on October 7. Two days later another attack of pain and again on November 7, which was six weeks after the last regular period. Ruptured extra-uterine gestation was diagnosed. Subtotal hysterectomy and removal of both appendages was carried out. In the left ovary was a cavity containing clot. No trace of embryonic tissue could be found either in the clot or in the ovarian cavity. The right ovary contained a ripe corpus luteum, the size of a corpus luteum of pregnancy. Rouffart argues that ovarian pregnancy ought not to be excluded in such a case merely because the products of gestation cannot be found.

SEREBRENNIKOWA, O. S. (Petrograd). "Ovarian Pregnancy," *Zentralblatt für Gynäkologie*, xxxvii, No. 43, p. 1592.

Patient, aged 28, three children. Ovum of 5 cm. found in the pouch of Douglas (cf. Oldfield's case). Left appendages normal. Right tube normal. Right ovary enlarged by a blood-cavity into which was a rent 1 cm. in length. This cavity was lined by lutein tissue. Probably a true ovarian pregnancy but no mention of chorionic villi in ovary.

1915.

SEEDORF, M. *Zentralblatt für Gynäkologie*, xxxiv, No. 37, p. 657 (quoted from *Monatsschrift*, xlii, p. 1).

A case of ruptured ovarian gestation ; reporter's view was that this is an undoubted intra-ovarial gestation.

The following cases are published in journals which are not at my disposal :—

1912.

ELLIOT, J. B. *Southern Medical Journal*, Nashville, v, p. 354-356.

ROITERS. *Pest. Med.-Chir. Presse*, Budapest, xlviii, p. 208.

STAPLETON, R. P. *Southern Medical Journal*, Nashville, p. 357.

TRAMBLIN and LAMBERT. *Bulletin Société de Médecine du Nord*, pp. 35-41.

MACLEOD, J. K. *Canadian Journal of Medicine and Surgery*, Toronto, pp. 81-91.

Idem. Two cases.

1913.

FRAZER, F. C. *Indian Hospital Gazette*, Calcutta, xlviii, p. 146 (one photograph).

HOPKINS, J. G. *Proceedings of the New York Pathological Society*, n.s., xii, pp. 84-87.

The following record is of interest as showing the type of case which used to pass muster as an example of ovarian gestation.

GEMMIL, JOHN, Surgeon in Irvine. "An Impregnated Ovarium."

A woman, aged about 30, of a strong, robust constitution, was hanged here on Thursday, January 16, 1735, for the murder of her child. I was informed by a sure hand that on January 1 she had her menstrua, and have reason to suspect that she was too intimate with some of her fellow prisoners. In dissecting her body I found both the tubæ Fallopianæ greatly distended; the left one was pale coloured, but the right tube appeared inflamed in its external coat. Having gently squeezed the left tube, a white body inclining to an oval figure, about the size of a large garden pea, dropped out at its extremity, with a good deal of whitish viscid liquor ; and, having squeezed the tube several times, a considerable quantity of the same sort of liquor was pressed out. The membranes of the roundish body were strong and tough, and contained a transparent gelatinous substance; the colour and consistence of the white-coloured liquor were like to the *semen virile.* The left ovarium was more than twice the bulk of the right one, and looked like a bag full of a dark brown-coloured water; but when it was opened a transparent viscid fluid ran out, and what remained was a reddish substance much of the same consistence as the crystalline humour of the eye has, being the greater part of what this ovarium contained. There was nothing uncommon in the right ovarium; about halfway between it and the extremity of the Fallopian tube I found in a duplicate of the membrane such a body as was squeezed out of the left tube, but it was shrivelled and decayed, with little in it of any liquor; the right tube was full of white matter as I squeezed out of the left tube.[1]

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[1] "Medical Essays and Observations," published by a Society in Edinburgh. Printed by Hamilton, Balfour, and Neill, 1752, article 23, p. 277.

Section of Odontology.

President — Mr. W. B. PATERSON, F.R.C.S., L.D.S.Eng.

(*November* 27, 1916.)

PRESIDENTIAL ADDRESS.

By W. B. PATERSON, F.R.C.S., L.D.S.Eng.

I THANK you for the honour you have done me in electing me your President. It is an honour which I greatly appreciate, and shall strive to deserve. We meet under circumstances of an unparelleled kind. The War's demands upon the services of dentists, who are of military age, have robbed this Section of the Royal Society of Medicine of its chief interest, for to attend a dental meeting nowadays for any other purpose than war business, is like a performance of Hamlet would be with the name part cut out. We must however carry on such business as arises, notwithstanding diminished interests and attendance of members. Many of us, who are past the fighting age, regret to see our dental brethren called up to serve as combatants in the ranks, at a time too, when there is a shortage of Army doctors. I say nothing of dentists for dentistry, nor of the formation of a Dental Corps for the Army and Navy. Such matters must stand over in view of the Government's pronouncement that the present system is satisfactory, and that "the supply of dentists for the forces is adequate." But I cannot help feeling that if only the War Office authorities would recognize the wisdom of calling dentists back from the ranks, and would employ them in their medical service, they could, at once, obtain valuable surgical assistance, such as dentists, by manual training and hospital experience, are able and willing to give. This, however, is not the place, even if it were the time, to discuss such questions; and moreover, the British Dental Association may safely be trusted to watch over them. I shall therefore, without further comment, suppress my strong personal feelings, and proceed with the business of the evening.

In the first place I have to express my regret that I have found it quite impossible to concentrate my mind, during these troublous times, upon a subject of purely scientific interest, which might fulfil all the traditional requirements of a Presidential Address. If therefore the few, somewhat desultory remarks that I venture to make by way of apology for such an address fail to interest you, I must plead the all absorbing topic of the War as my defence, and beg that you will extend to me your kind indulgence.

From all I have seen and read of jaw injuries in this War, and from the limited number of gunshot cases that I have personally treated, I should imagine that the time is not ripe yet to express a final judgment upon the various methods of treatment which have been adopted or advocated. Those of us who have had much experience of general hospital practice have seen and treated many jaw injuries, and possibly our treatment of some of them, as in the case of fractures, may have become somewhat stereotyped. But all of us, I think, must admit that the results of gunshot injury in this War have very considerably altered our methods of treatment. More especially is this so in cases of fracture of the jaw. In these cases we see great comminution of bone, splintering of teeth, extensive laceration of soft tissues, and the common supervention of sepsis. And these complications in conjunction serve to modify greatly the methods of treatment formerly pursued in civil practice. For an example let me cite the use of mouth splints. In civil practice it is, and always has been, the aim of the dental surgeon to immobilize a fracture of the jaw by an interdental splint, at the earliest possible moment, thereby converting a compound fracture, as it is, with attendant risks of suppuration, into a simple fracture; and by the immobility obtained allowing rapid healing of the torn soft tissues, as a protection against sepsis. Now, owing to the severe and smashing nature of the injury to both hard and soft tissues, and the association of septic conditions in the wound from the outset, treatment by immediate splinting, interdental, or otherwise, is necessarily delayed until such time as the septic inflammation is either past, or greatly allayed. In some cases the swelling and sloughing of the wound is so extensive as to prevent the possibility of any form of interdental splinting being applied at all. I have seen more than one such case of multiple fracture recover, with complete restoration of masticatory function, under no other treatment throughout than free drainage and antiseptic lavage of the wound, combined with the external support of gauze padding and bandage—a lesson, it may be said, to any dental surgeon in a hurry to apply mechanical treatment, in Nature's powers of repair if unimpeded.

For another example of the differences in treatment, as seen in civil and war practice, I turn to the forms of mouth splints in use. The Hammond splint, a wire interdental splint, much in favour in the treatment of fractures of the body of the mandible in civil practice, is now much less used in war practice. Tooth capping plates cemented on the teeth appear to have superseded it, as both simpler to make and easier to apply. Although the risk of altering the "bite" by a capping plate is ever present, it may be regarded as almost negligible when care is exercised.

The Gunning splint of single, rather than double, form, either made of vulcanite or metal, appears to keep its place in war practice, as in civil practice, as a most useful means of immobilizing fractures of both jaws. Its tendency to hold food and impede the free flow of discharges does not appear to promote sepsis to any but a very slight extent, owing no doubt to the greater care that is now taken in the nursing of the case by means of frequent antiseptic douches. Even the unpleasant odour of vulcanite in the presence of suppuration, or the still worse odour of the silver, or alloy splints, is readily overcome by douchings and deodorants.

In the many and various devices for splinting fractures as seen in this War "necessity is the mother of invention." Besides the splints of civil practice like the Hammond, the Gunning, and the Kingsley, other forms of fixation have been borrowed from orthodontic practice and dental mechanics generally. In fact there are no limits to the varied ingenuity that a skilful dentist may display in his work. One form of fixation of fracture of the mandible—viz., wiring the bone—does not appear to have found favour with surgeons or dental surgeons in this War, doubtless owing to the septic nature and greater comminution of gunshot fractures. In civil practice in the past, jaw-bone wiring had few advocates at best. I confess I was never one of them.

To take another example in a comparison of civil and war practice. A prominent feature in war practice is the care taken to save every bony fragment in a multiple and comminuted jaw fracture, except such as is obviously in a state of necrosis or sequestration. It was formerly asserted that the mandible was more prone to necrosis in comminuted fracture than the maxilla, owing to an alleged poorer blood supply. This War has shown us cases of multiple fractures of the mandible uniting most satisfactorily. I recall at the moment a case in which the mandible showed in the radiograph five lines of fracture at the angle. Any one of the loose fragments could easily have been removed, and doubtless would have been removed some years ago, in order to prevent the onset of probable necrosis. Nevertheless the parts became adherent, and the angle was perfectly restored both as regards appearance and function some four months afterwards.

Whilst war practice has taught us to save bone fragments, it has dealt hardly with the teeth. Many teeth, both near to and remote from the lines of bone fracture, have had to be removed to obviate delay in bony union, some as a result of fracture in themselves, others of loosening, and others again which were the subjects of septic pulp or periodontal inflammation.

Differences of opinion among dental surgeons prevail as to the question of septic teeth. Some limit the operation of extraction to the teeth immediately adjacent to the fracture; others freely extract all teeth to which the term "septic" can be applied. In civil practice we must often have seen fractures of the maxilla and mandible unite, within an average period of from six to eight weeks, where no teeth, either clean or septic, have been removed. In cases of delayed union we have commonly found a loose tooth, or a root in the line of fracture, to be the cause. Furthermore, we have probably noticed that the extraction of the tooth on either side of the line of fracture, in a crowded dental arch, diminished the risk of delayed union from loose teeth, and prevented the after-formation of a gum pocket. But war practice has modified one's attitude towards the extraction of teeth. Our Curator, Mr. J. F. Colyer, has lately demonstrated to us certain cases of delayed union of fractures caused by septic teeth. Teeth, apparently remote from the line of fracture, were found to be directly in connexion with it by means of fissures running through the bone. This condition was quite unsuspected and could only be observed in a radiograph. In future, therefore, we must pay more attention to the position of septic teeth in relation to the fracture, and our chief assistance will be found in a clear and well-taken radiograph.

Before leaving the subject of fractures, I should like to institute one more comparison between civil and war practice, in a reference to fracture of the ramus. Here I venture to think that the treatment for once coincides. In civil practice I have never found it practicable, or even necessary, to apply any form of internal mouth splint for fracture of the ramus. I have seen excellent results follow upon treatment by external support only, such as pad, bandage, and a metal chin splint of aluminium or tin, which can either be made by the dentist or procured from the surgical instrument maker. In war practice I have seen similar good results follow upon the same treatment.

Another class of injury, but seldom seen in civil practice although quite common in war, is that in which a considerable portion of the body of the mandible is lost. We are all aware of the ghastly deformity which so frequently results from the ends of the bone falling together, and uniting either by fibrous tissue or bone. We recognize the loss of all dental occlusion, as well as the impossibility of restoring it by mechanical means. Most of the models shown at our recent meetings illustrate the belated attempts made by dental surgeons to prevent permanent deformity, by expanding the contracted arch before complete osseous union has occurred. We dental surgeons are all agreed that the sooner we can be called in to treat such cases the better is the outlook for the patient. I need not trouble you with the details of treatment, as both principles and details are well known to you. What I desire to refer to more particularly, in these cases of considerable loss of bone, is the question of the patient's future. In one case we see the mandibular arch contracted and deformed to such an extent that any dental occlusion is impossible. In another case we see the mandible in two portions both freely movable upon their condylar joints, and upon one another, the free ends remaining connected by a fibrous band. Both conditions mean for the sufferer a miserable existence, and a minced diet for life. There is a chance of improvement in the second case, or that of fibrous union, provided sufficient jaw rigidity can be obtained by a bridge fixed to the teeth. In the absence of conditions favourable for bridgework, we are obliged to have recourse to a form of removable denture which spans the space between the bone ends by fitting into it. Not a satisfactory arrangement for masticating anything beyond soft food, and an extremely irksome apparatus to wear when one portion of the mandible contains no teeth to which it can be fitted or capped. I have had examples of both these cases under my observation for varying periods of years. In the case of osseous malunion no dentures that could offer the slightest masticatory value were possible owing to the greatly contracted and V-shaped nature of the mandible. The encroachment upon the tongue space was met by a shrinkage of the tongue itself, thus obviating an additional misery for the sufferer.

In the cases of fibrous union, bridgework, where applicable, gives great comfort from the jaw rigidity and masticatory powers that it affords, but, of course, there are limits to its longevity. An example of fibrous union in which bridgework was impossible has been under my observation for upwards of fifteen years. An interest attaches to the case in that the patient always looks well nourished despite the fact that the mandibular portions are freely movable and remain separated from one another by a space of an inch and a half on one side. No apparatus has succeeded in establishing anything like rigidity in the jaw. The best that has happened has been a steadying power and help to the muscles in co-ordinating movements of the jaw. Of several dentures tried, the one that has answered best has been one of vulcanite with the block fitting into the space faced with soft rubber. This soft rubber has required renewal on three occasions during fifteen years. In cases where only a small loss of bone has occurred —e.g., an inch or under—especially if it is in the region of the symphysis, I should allow the bone ends to unite by osseous tissue, and afterwards endeavour to correct the appearance and "bite" by means of a denture. But the whole question of treatment turns upon the success or non-success of bone-grafting. Given a successful means of bone-grafting no one would allow mal-union of any kind to occur. And if by chance mal-union had occurred, an operation for refracture, or for refreshing the bone ends, would be undertaken preparatory to fixing a graft. I watch with great interest, therefore, the attempts at bone-grafting that are being made. I have no personal experiences to relate, but if a choice of bone from which to take a graft were forced upon me, I should elect for my tibia rather than for my rib. Preferably, however, I should like a graft taken from a young bone.

Time will not permit of my touching upon the vast subject of treatment of maxillo-facial deformities caused by this War. Plastic surgery in the hands of the skilful surgeon, assisted by mechanical art on the part of the dental surgeon—and we must not forget to add in this connexion the wig maker and glass-eye maker—will do much in the future for the relief and improvement of these distressing cases. I merely mention the subject in the hope that members will be able at future meetings to show patients exhibiting successful results.

In concluding these remarks, which I fear have been somewhat discursive, I am conscious that, to those of you who are daily engaged in war practice, they may appear to demonstrate the obvious. I must beg forgiveness, on the ground that my zeal, in relating personal experiences, has outrun what may be termed my presidential discretion. I feel that I am still a student, and have much to learn from the experience of others in war work; hence I look forward with pleasure to my period of office, as your President, as a fitting opportunity for an increase of knowledge.

A Report on the Inter-Allies Dental Congress, held in Paris, November, 1916, was presented and read by Mr. T. A. COYSH.

(*November* 27, 1916.)

Fuso-spirillary Peri-dental Gingivitis.

By Frank E. Taylor, M.D., and W. H. McKinstry, M.B., Captain R.A.M.C.

During the last few months large numbers of officers and men suffering from sore throat have been sent to the laboratory at the Queen Alexandra Military Hospital for bacteriological examination. As the result of the investigation of these cases, we have found spirilla and fusiform bacilli co-existing with or without a variety of other organisms, both cocci and bacilli.

The association of fusiform bacilli and spirilla with sore throat, often of a membranous or pseudo-membranous character, was first pointed out by Plaut in 1896, whilst the condition and its causal organisms were more carefully and completely described by Vincent in 1898. Since that date this inflammatory condition of the throat has generally been designated Vincent's angina, and the causative organisms have become known as the spirillum and *Bacillus fusiformis* of Vincent. The condition in Vincent's angina is usually an ulcerative or pseudo-membranous pharyngitis, and smear preparations taken from the affected parts, after proper fixation and staining, readily show the presence of the characteristic organisms of Vincent.

A further and more critical study of the cases sent to us revealed the fact that this condition was not always confined to the pharynx, but might also be present, as other observers have noted as well, on the mucous membrane of any part of the mouth and gums, constituting a fuso-spirillary stomatitis and gingivitis. In some of these cases the gingivitis is widely spread over the surface of the gums, but in others the ulcerative condition is confined, more or less closely, to the portion of the gums in close contact with the neck of the teeth, so as to constitute a real peri-dental or marginal gingivitis. It is to this condition of ulcerative fuso-spirillary peri-dental gingivitis and its relationship to Vincent's angina of the pharynx and to the character of the organisms found in the two conditions, that we desire to call attention in this communication.

An examination of the gums and teeth in patients the subjects of this infection usually reveals the following conditions: The teeth are frequently tartarated and unclean, showing evidence of great neglect—although this is not invariably the case, as in many of our patients the sound and well-groomed condition of the teeth was particularly noticeable. In an advanced and well-marked case the gums are red, swollen, and ulcerated in immediate contact with the neck of the teeth, and extending out for a variable distance, seldom exceeding ¼ in. The ulcerated surface is often covered with a soft, grey, foul-smelling exudation. The slightest touch with a swab or platinum loop to the ulcerated surface causes profuse bleeding. Any attempt on the patient's part to use a toothbrush also causes free bleeding, so that it must be temporarily discarded. The extent of the ulceration varies greatly, being limited in some cases to the neck of one or two teeth, in others extending the whole length of the upper or lower gums. The infection seems to show predilection for certain situations, being most frequently found about the lower central incisors, and behind the last lower molars. It is also frequently found about crowned and stopped teeth. In some cases the ulceration is limited to the tops of the papillæ between the teeth and to the parts of the gum separated from the teeth. In the slighter cases the ulceration around the necks of the teeth may not be readily visible, though the patient may only complain of bleeding of the gums on cleaning the teeth with a toothbrush. In these cases the affected areas are readily found and exposed by lightly rubbing the gums with a pledget of cotton wool, when oozing of blood immediately occurs. In the more severe cases, in addition to the bleeding, the patients complain of tenderness on pressure, and on mastication: whilst in two or three very long standing cases the affected teeth have become quite loose. In the majority of our cases the ulceration has developed slowly, and been of long standing, the patients stating that the gums have bled readily, and a foul taste has been present in the mouth for many weeks, months, or even years, and it is in these latter cases that the loosening of the teeth has been observed. In a few cases, on the other hand, the disease seems to run a more acute course, extensive ulceration developing in a few days. Hence the cases can be classified as acute or chronic. However developed, whether rapidly or slowly, the same condition results. The temperature in the uncomplicated disease is never raised, nor are the lymphatic glands enlarged or tender.

With regard to the ætiology of this affection, its wide-spread prevalence amongst the troops in London at the present time suggests its infectivity, which is definitely proved by the results of bacteriological examination. In the majority of our cases the men were living in barracks—possibly overcrowded as the result of war conditions—but some came from camps, some from billets, and not a few were officers resident at their own homes. In some of these cases we found both husband and wife infected. A very similar, if not identical, condition clinically is extremely prevalent, we are given to understand, among both the British and French troops at the Front, being especially widespread in the French Army. The dental surgeons, we believe, find these cases very refractory to treatment, and are in the habit of speaking of them as "trench gingivitis," or "trench gum." We are not aware that this condition has been investigated bacteriologically, but from various descriptions we have heard, we are of opinion that the bacteriological findings would probably be the same as those we have obtained and describe here. That toothbrushes may become infected we have proved by finding the organism in the toothbrushes used by a few of our patients, and there can be little doubt that all articles coming in contact with the mouth may be similarly infected and become foci of infection.

Only the other day, and after this paper was written, the following suggestive history, indicating how the infection might be spread by toothbrushes, was brought to our notice. Sixteen men in billets in a certain private house were in the habit of keeping their toothbrushes on a common shelf. We have already had three of these sixteen men for treatment, and have examined the toothbrushes of two of them with positive results. About four weeks ago the third patient accidentally used one of the brushes since found to be infected, and to this he attributes his complaint, the gums becoming sore and bleeding about one week later.

Diet does not seem to play any part in the production of this disease, and it apparently has no relation to scorbutic affections of the gums, as fresh vegetables, or fresh fruit, or usually both, had been taken by all our patients.

The suggestion that lack of cleanliness is the important causative factor is entirely negatived by the number of cases we have seen in which the condition of the teeth themselves proves that hygienic measures had been systematically and scrupulously carried out.

The diagnosis of the disease is a comparatively simple matter. The character of the ulceration of the gum in close proximity to the neck of the teeth, with special predilection for the lower central incisors and wisdom teeth, the overlying soft greyish exudation, the readiness with which bleeding is elicited, and the fœtor of the breath; all provide a clinical picture by which the disease can readily be recognized. This diagnosis is readily confirmed by a bacteriological examination, the microscope revealing the presence of fusiform bacilli and spirilla—both Gram-negative organisms, either alone or together with a variety of other organisms—cocci, bacilli, and leptothrices.

Many of our patients had already been under treatment, often for a considerable time, usually without much improvement, if any at all. They came to us with a diagnosis of pyorrhœa already made, and in some cases had been advised to have their teeth extracted. Now in this condition oozing of pus from the tooth sockets, and the presence of pockets of pus, as seen in pyorrhœa, do not occur, and we consider that this disease should be sharply differentiated from pyorrhœa. The clinical history, the treatment, and the prognosis of the two conditions are totally different.

As regards treatment, this is not commenced until the diagnosis has been established by bacteriological examination. Only those cases in which the typical Gram-negative fusiform bacilli and spirilla are found are included under this heading. In those cases in which the teeth are unclean and tartarated, the patient is sent to the dental department, where the teeth are scaled, and the tartar and membranous deposit are removed from the gums with a glycothymoline spray, under a pressure of 30 to 40 lb. to the square inch. The gums are then carefully dried with pledgets of absorbent wool, and afterwards painted freely with a 0·2 per cent. alkaline solution of salvarsan or kharsivan as prepared for intravenous injection. The drying and painting of the gums are then repeated at least once, and preferably twice, daily. On account of the tenderness of the gums, the scaling of the teeth may need to be done at two or three sittings, the swabbing of the gums with salvarsan being carried out between the sittings. Usually marked improvement is noticed in twenty-four to forty-eight hours, and the disease yields entirely to treatment in the majority of the cases within fourteen days if daily applications have been thoroughly and systematically carried out. In a few cases where improvement appears to be somewhat delayed under this treatment, we vary the medicament which is applied locally, the most successful results being obtained with a mixture containing vinum ipecacuanhæ, liquor arsenicalis, and glycerine. Other preparations also giving good results we have found to include: 10 per cent. solution of quinine and colloidal preparations of iodine and silver (collosol iodum or collosol argentum). In a few cases, chiefly in officers remaining on duty during treatment, more prolonged attention has been found necessary, but in these cases the attendance of the patients was irregular, and so prevented that regular and systematic swabbing which we have found essential for success. In all cases mouth-washes of peroxide of hydrogen, or chlorate of potash, with carbolic acid, were prescribed to be used freely after each meal. Patients were also advised to destroy their toothbrushes, pipe mouth-pieces, cigarette-holders, and all articles coming in contact with the mouth, and obtain new ones at the end of their course of treatment. In one or two cases the dental surgeon has found it necessary to remove carious teeth, and in one of these where the gums were badly ulcerated—a deeply excavated ulcer also existing behind the last lower molar which was extracted—we were able to demonstrate the presence of a fusiform bacillus at the apex of the root of the tooth.

During the course of treatment outlined above, marked, and as a rule, rapid improvement is observed—the ulceration of the gums heals, the pain, the bleeding, and the fœtor of the breath all disappear, and where the teeth have been loose, they tighten up again. In no case have we found it necessary to have the teeth extracted for this condition. Microscopic observations show that along with this improvement there goes *pari passu* a diminution of the number of fusiform bacilli and spirilla, and when the cure is complete, these organisms have entirely disappeared. No case is discharged by us until it has been proved microscopically to be free from both the spirillar and the fusiform organisms.

To various members of the staff of the Queen Alexandra Military Hospital, and especially to our dental colleagues, Sir Francis Farmer and Captain Johnson, R.A.M.C., we are indebted for many of our cases and for the interest they have displayed in the results of our work.

DISCUSSION.

Mr. PERCY EDGELOW: I am much interested in Dr. Taylor's and Captain McKinstry's paper, having attended a considerable number of officers of the Royal Flying Corps for acute septic gingivitis. I had entertained an impression that the particular nature of their avocation was in some way responsible for the prevalence of the trouble, but after the authors' remarks as to the frequency with which he has come across it in other branches of the Army, it is obvious that the particular conditions surrounding "flying" will not suffice to explain these attacks. I agree with him that this gingivitis is an affection distinct from pyorrhœa alveolaris, though no doubt they are to be found co-existent in the same mouth. I also have found that the gums and soft tissues around the wisdom teeth are very liable to be affected, particularly in the lower jaw, with accompanying swelling and tenderness of the neighbouring pharyngeal mucous membrane, a painful submaxillary gland being often present. The adjacent mucous membrane of the cheek is occasionally so swollen as to intrude between the opposing molars and is lacerated when biting, causing a very painful inflamed and ulcerated condition and leading to difficulty in opening the mouth beyond one third of its normal width. The fœtor of the breath is great and there is often pronounced general malaise. The swollen condition of the gums leads to free bleeding on the slightest instrumentation, and to the formation of pockets between the necks of the teeth, particularly in the molar and premolar regions. Marginal sloughs are frequently present. Solid food is avoided in very acute cases on account of the pain during biting, and fluid nourishment alone is tolerated. The affection is apparently uninfluenced by the actual condition of the teeth as regards caries, many of the acutest attacks coming under my notice having occurred in mouths possessing a full and sound set of teeth. As regards treatment, I first give an iodine wash to rinse the mouth thoroughly and then freely apply a mixture of equal parts of carbolic acid and camphor. The camphor prevents the caustic and irritating effect of carbolic acid used in a strength of 1 in 2. The extreme tenderness and free bleeding quickly yield to this treatment. For home use I rely on mouth-washes of carbolic acid and alum, or permanganate of potash. In exceptionally severe cases with much swelling and ulceration of the mucous membrane near the wisdom teeth accompanied by laceration of the cheek mucous membranes, I have extracted the upper wisdom tooth under novocaine with rapidly beneficial results. I select the upper wisdom tooth for three reasons: (1) It articulates with the lower wisdom tooth alone, whilst the latter has the benefit of articulating with both the second and third upper molars; (2) it is much easier to extract than the lower wisdom; (3) owing to its better drainage the upper wound heals more rapidly than the lower one.

Mr. SCHELLING: Are cultivation and other means requiring considerable time, necessary to confirm the existence of the micro-organisms described? For the cases which I have been called upon to treat presenting a similar appearance to those just described are generally those of officers, home on six or ten days' leave, who are anxious to have as much relief as possible in the fewest number of visits. The treatment adopted consists of, at first visit: (1) Free swabbing with peroxide of hydrogen 10 vols.; (2) complete painting with lin. iodi. applied on a small pellet of cotton and used both for its antiseptic action and its property of staining all the tartar so that it can be more easily removed with appropriate fine scalers; (3) polishing with a buff and pumice powder; (4) seeking for pockets and packing them with cotton plugs moistened in saturated solution of chinosol, the pockets behind the wisdom teeth being similarly packed with small plugs moistened in pure carbolic acid. A second visit next day to remove the plugs and complete the scaling and apply iodine, and if necessary more visits for chinosol dressings in pockets on each occasion and, finally, instructions to the patient thoroughly to brush the gums inside and out daily with a palate brush and a little table salt and to return for inspection at the next opportunity.

Mr. A. PARKER CATER (Lieutenant G. B. C., 36 Corps d'Armée française): One of many experiences in connexion with the work and organization of the Dental Operating Vans which I took to France, for service with the French Army at the Front, has been the large and increasing number of cases of what we called "trench gingivitis" and known on "this side" as "trench gum." Whatever may be its correct nomenclature the fact remains that its lowering effects on the men's general physical condition and efficiency is most marked. Not only does it attack the gums around the teeth but it also shows itself in patches of varying size over the gums and inside the lips and cheeks according to the severity of the case. At a certain stage it might have been mistaken for "pyorrhœa" pure and simple, but the extreme rapidity with which the symptoms developed appeared to me to suggest a specific organism as being the actual cause of the complaint. The "services" of these motor dental surgeries being chiefly devoted to men *coming out of* trenches led one at first to think that the trouble might possibly be confined to the front line troops. I am now, however, constantly discovering that the complaint is spreading not only to men who have never been near the trenches or even out of England, but also to civilians. In practically all these cases it appears to be pretty certain that they have been in actual or indirect contact with infected individuals. It has been suggested to me that it is invariably caused by neglect or want of cleanliness. As against this, and also to demonstrate how highly infectious it appears to be, I have frequently found it in mouths where there was no lack of cleanliness. As I have had attacks myself, one may fairly anticipate that this would not be brought about by any neglect on my own part. As already stated, I am of opinion that some special organism is the active cause of the trouble. It is highly infectious and need not necessarily be caused by lack of, or inability to secure, "oral" cleanliness, because if such lack of cleanliness was the dominating cause of the trouble one might expect, practically, nearly every man at the Front to be affected. The treatment indicated as far as my experience goes appears to be thorough scaling and cleaning as soon as the tenderness permits; frequent irrigation under pressure; applications of liquor arsenicalis with vini ipecac. and glycerine alternated with salvarsan, also iodine; frequent and *proper* use of *clean* toothbrushes and vibratory or digital massage. In stubborn cases I found that ionic medication yielded quick and satisfactory results. Educational treatment consists in teaching men to avoid using each others drinking bottles or other utensils, which in spite of Army Regulations. they persist in doing; the passing on of pipes, cigarettes, towels, &c. The renewal of toothbrushes should also be more frequent. As far as possible a rapid examination of troops leaving trenches for rest camps has been made, and on several occasions, I have found that a man with a comparatively clean mouth, would, in two or three days, develop an acute condition of trench gum, with putrescent discharge around necks of teeth, bleeding and swollen gums, teeth loose and so tender as to be useless for masticating; fœtid breath, furred tongue and general feeling of "malaise" and slackness. If a man develops this acute condition in the trenches, which he frequently does, he becomes of little practical use as a fighting unit, he cannot tackle his trench rations, loses nerve and also becomes an infectious menace to his fellows. The "toilette" of the mouth whilst in the trenches is very difficult, and often impossible, unless men can be provided, as part of their kit, with a paste in the form of kolynos, or some such preparation, —which they are not. As a great many civilian, as well as military, dental surgeons are now constantly having to deal with this complaint, it will be very helpful and interesting to obtain their experiences and opinions on the subject. At one base consisting mainly of chefs, and cooks engaged in bread-making, we recorded no cases of trench gingivitis. There were nearly 700 of these cooks. I have not found any cases of the complaint in men suffering from *fractures* or *traumatic* injuries of the mouth, either in France or on this side.

Dr. J. D. ROLLESTON: Is not the condition described by Dr. Taylor and Captain McKinstry the same as that described by Vincent as "ulcero-membranous stomatitis," which is due to the same organisms as Vincent's angina, and was occasionally associated with it?[1] Being attached to the Val de Grâce military hospital, Vincent especially noted its occurrence amongst soldiers and its liability to arise in connexion with the last molar tooth. It was frequently seen among the recruits from Normandy and Savoy whose teeth were predisposed to caries by drinking cider. As medical officer in a fever hospital I have been interested in the condition for many years.[2] Like Vincent's angina, it may occur as a primary condition or be secondary to some other acute infection such as scarlet fever or measles. I agree with what the authors have said as to the absence or slight degree of general disturbance. I lay special stress on the peculiar fœtor as of diagnostic value. As regards what has been said about the occurrence of fusiform bacilli in suppurative conditions, it may be noted that Vincent found them in a number of suppurative processes in connexion with the alimentary tract as well as in a case of pyothorax.[1] What relation do the authors think this condition bears to cancrum oris, which I regard as a further stage of ulcero-membranous stomatitis, just as gangrenous angina is a further stage of Vincent's angina?[2] In all these conditions the fuso-spirillary symbiosis is met with. As regards prognosis and treatment I have found that the condition as a rule is mild and yields readily to simple treatment, such as applications of tincture of iodine, methylene blue, or a mouth-wash of potassium chlorate and myrrh. In rare cases local application of salvarsan[3] may be required.

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[1] Vincent, *Compt. rend. Soc. de Biol.*, 1904, lvi, p. 311.

[2] J. D. Rolleston, *Brit. Journ. Child. Dis.*, 1910, vii, p. 299.

At the conclusion of the discussion, the authors accepted the President's suggestion that the word "gingivitis" should be used instead of "periodontitis."

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[1] Vincent, *Comp. rend. Soc. de Biol.*, 1905, lvii, p. 772.

[2] J. D. Rolleston, *Brit. Journ. Child. Dis.*, 1912, ix, p. 314.

[3] J. D. Rolleston, *Proceedings*, 1913, vii, Clin. Sect., p. 1; and *Practitioner*, 1913, xci, p. 847.

Section of Odontology.

President—Mr. W. B. PATERSON, F.R.C.S., L.D.S.Eng.

(*January* 22, 1917.)

Case of Facial Restoration by Means of a Mechanical Appliance.

By J. LEWIN PAYNE, M.R.C.S., L.D.S.

THE patient was a corporal in the West Yorkshire Regiment, aged 24, who received a gunshot wound on November 17, 1914, which carried away the whole of his upper lip, a piece of the nose and the anterior portion of the superior maxilla; the mandible was fractured on the left side in the first molar region. The upper lip, with the portion of the maxilla and the teeth attached, was found in the trench the next day. During the first five months after the injury several teeth and pieces of bone were removed from the mouth, but he received no special treatment from a dental surgeon.

In April, 1915, the patient was sent to Guy's Hospital, under the care of Sir Arbuthnot Lane. Owing to the large amount of hard and soft tissue that had been lost, and also in consequence of the long interval that had elapsed since the injury was inflicted, Sir Arbuthnot Lane was of opinion that a plastic operation was not advisable, and he asked me to see the patient with the object of fitting an appliance.

Suppuration was still going on when I first saw him and several small sequestra and septic roots were found in the mouth. In the superior maxilla everything in front of the second premolar on the right side and in front of the second molar on the left had been lost. The patient was very depressed, he avoided seeing other people in the ward, and insisted upon wearing a muslin mask below the eyes so as to cover his deformity. The septic roots and a few small sequestra were removed under an anæsthetic without delay and the mouth was kept constantly irrigated. Suppuration soon stopped. A temporary appliance was fitted two or three weeks after the extraction of the roots. This consisted of an artificial vulcanite lip attached to a vulcanite denture which was held up by means of clasps. To the artificial lip a moustache was attached. A denture was also fitted to the lower jaw.

In November last the patient came to the Maxillo-facial Hospital at Kennington to have his permanent appliance fitted. He now wears that appliance, which is similar to the temporary appliance except that the lip portion is detachable and is made of aluminium with two parallel rods fitting into tubes in the front of the upper denture.

Mr. Howard Mummery kindly undertook the colouring of the portion of the artificial lip which remained uncovered by the moustache.[1]

(*January* 22, 1917.)

Mandibular Anæsthesia.

By A. E. Rowlett, L.D.S.Eng.

Local anæsthesia, and more especially conductive local anæsthesia, has not received in this country the attention which, I venture to say, it merits. For our information, drugs, instruments and technique, we are very largely indebted to foreign scientists, such as Braun and Fischer, and it is to their writings that I owe my introduction to the subject which is to occupy our attention to-night. The radiographs showing the needle in position I had thought an original idea, and it was a disappointment to find that such photographic representation had already been carried out by Thoma.

The advance in the technique of local anæsthesia for conservative operations in the mouth, in my opinion, marks an era in dentistry, and its intelligent application will help to solve many of the difficult problems that confront our profession. Local anæsthesia of both maxilla and mandible would present too large a field for anything like thorough treatment in the limited time at our disposal. Mandibular anæsthesia appealed to me because, before I adopted the technique to be described, dentinal anæsthesia in the lower jaw, and especially of the lower molars, was generally a matter of considerable difficulty. My aim is to present my subject before you in such a way that you may be able clearly to visualize an operation which can only be perfectly explained by the aid of clinical demonstration. To this end we will first consider the anatomy of the mandible, paying particular attention to these parts of the osseous framework, and of the soft tissues which are intimately connected with the technique of injection and the results obtained from such injection.

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[1] Two illustrations of this case appeared in the *Proceedings*, 1916, ix (Sect. Odont.), p. 76, and which are reproduced (figs. 1, 2) together with another showing present condition of the patient (fig. 3), on p. 40 of this number.

THE BONY MANDIBLE.

The internal surface of the body of this bone is smooth and dense around the roots of the teeth, and the only canaliculi to be found are those beneath the incisor teeth. These canaliculi communicate with the mandibular canal and the absence of such foramina is a contra-indication for infiltration anæsthesia. About the middle of the ascending ramus is seen an irregular shaped opening—the inferior dental foramen, which transmits the inferior dental vessels and nerve. This canal runs downwards and forwards into the bone, and its anterior margin is prolonged into a sharp ridge to which is attached the internal lateral ligament of the jaw. The course of the canal in the bone is thus described by Gray: "The inferior dental canal runs obliquely downwards and forwards in the substance of the ramus, and then horizontally forwards in the body; it is here placed under the alveoli with which it communicates by small openings. On arriving at the incisor teeth, it turns back to communicate with the mental foramen, giving off two small canals which run forward, to be lost in the cancellous tissue of the bone beneath the incisor teeth. This canal in the posterior two-thirds of the bone is situated nearer the internal surface of the jaw; and in the anterior one-third nearer its external surface. Its walls are composed of compact tissue at either extremity and of cancellous tissue in the centre." The upper part of the canal is expanded into a fairly well-defined fossa, which is, of course, superior and posterior to the opening of the canal, and this is known as the pterygo-mandibular fossa, from its relation to the mandible and the internal pterygoid muscle.

The following muscles claim our attention: The internal pterygoid, attached at the angle running upwards and inwards to its origin in the pterygoid fossa, the palate bone and its tuberosity, and tuberosity of the superior maxilla. It is convenient to consider this muscle internally as corresponding to the masseter muscle externally, with the ascending ramus of the mandible between. The space between the internal pterygoid muscle and the mandible, which contains the inferior dental vessels and nerve embedded in loose connective tissue, is most important in conductive anæsthesia. The mylohyoid muscle, attached to the mylohyoid ridge, is of interest, because of its nerve supply, a small branch of the inferior dental. A few fibres of the superior constrictor are attached to the alveolar border above the mylohyoid ridge. The temporal muscle is attached to the coronoid process, and these muscles may be pierced by the needle whilst injecting for anæsthesia of the inferior dental nerve. The external pterygoid muscle is attached to the pterygoid fossa of the condyloid process. The external surface of the mandible, according to Fischer, always exhibits sieve-like perforations on the alveolar ridges at the necks of the teeth; the cancellous areas are limited to the anterior portion in the mental region. As one would expect, these foramina tend to disappear, and the bone to become denser with age. Midway between the alveolar border and the lower border of the mandible, and immediately between the two bicuspid teeth, is placed the mental foramen, which transmits the mental vessels and nerve. This canal runs inwards, downwards and forwards, and communicates with the inferior dental canal. The buccinator muscle is attached to the alveolar border opposite the three molar teeth, and the masseter to the lower half of the ramus and angle of the jaw. The external oblique line runs upwards and backwards from the base of the mental process to be continuous with the anterior border of the ramus. The anterior border of the coronoid process presents two ridges, the inner one of which is merged into the internal surface of the process. The triangular space between these two ridges, and posterior to the last molar tooth, is known as the retro-molar fossa.

When looking at the mandible anteriorly, we should particularly note that the internal oblique line is situated externally to the line of occlusion, and also, that the anterior portion of the internal surface of the ramus is inclined inwards and backwards, and does not face directly inwards.

THE INFERIOR MAXILLARY NERVE.

The inferior maxillary division of the fifth cranial nerve arises from the Gasserian ganglion, and enters the pterygo-maxillary region through the foramen ovale; it is mixed nerve trunk, the motor root joining the sensory nerve just external to the foramen ovale. It lies here under the external pterygoid muscle, and after a short course divides into an anterior and posterior branch. Before division it gives off two branches, the nervus spinosus and the nerve to the internal pterygoid. The smaller anterior division is almost entirely motor, and supplies the muscles of mastication; its branches are masseteric, deep temporal, long buccal and internal pterygoid. The posterior division is almost entirely sensory, and has three branches; the auriculo-temporal, generally arising by two roots which embrace the middle meningeal artery; the lingual nerve and the inferior dental. With three of these branches we are very particularly concerned—the buccal, the lingual, and inferior dental; they, therefore, demand a somewhat detailed description.

The buccal, or long buccal, runs between the two heads of the external pterygoid muscle, to which it supplies a branch, beneath the anterior border of the masseter, to reach the outer surface of the buccinator muscle, the integument and the mucous membrane lining the internal surface of the muscle.

The lingual nerve lies at first beneath the external pterygoid muscle together with the inferior dental nerve, being placed to the inner side of the latter nerve; it then passes between the internal pterygoid muscle and the inner surface of the ramus and crosses obliquely to the side of the tongue running to its apex, lying immediately beneath the mucous membrane. It supplies the mucous membrane of the mouth, the gums, the sublingual gland, the fungiform and filiform papillæ and mucous membrane of the tongue.

The inferior dental nerve, the largest of the branches of the inferior maxillary nerve, comes from under the external pterygoid muscle, lies on the internal lateral ligament of the lower jaw, and enters the inferior dental canal. It is accompanied by the inferior dental artery and veins.

Its branches are: (*a*) Mylohyoid, given off just before entering the foramen; (*b*) dental, supplying the molar and bicuspid teeth; (*c*) incisive, which is continued onwards in the bone to the middle line and supplies the canine and incisor teeth; (*d*) mental, which emerges from the mental foramen, and supplies the skin of the chin and the skin and mucous membrane of the lip. This nerve at the middle line communicates with branches of the nerve of the opposite side.

INSTRUMENTS.

For conductive anæsthesia, where we are often injecting somewhat deeply among the tissues and approaching important vessels and structures, it is very necessary that as perfect asepsis as possible be maintained both in the solution and in the instrument used for injecting the solution.

The syringe should be constructed entirely of metal or of glass and metal. Most of the dental syringes upon the market are unsuitable, since they contain washers of either leather, rubber or some other packing. These washers are very difficult to keep clean, do not stand boiling well and deteriorate when kept in spirit. It has also been the custom to lubricate such syringes, and I think that it is evident that such syringes leave much to be desired from an aseptic point of view. For some of the injections used in dental work considerable pressure is necessary, and the ordinary aseptic syringes upon the market are neither made with sufficient accuracy of fit, nor are they constructed so as to permit the fluid to be expelled with sufficient force. These objections do not apply so strongly in mandibular anæsthesia as no great pressure is needed for this injection.

Undoubtedly the best dental syringe yet constructed is the Fischer syringe, but of course this is not obtainable at the present time. Mandibular anæsthesia, however, can be perfectly well performed by the ordinary surgical aseptic syringe, consisting of a glass barrel with metal mounts and a metal plunger. The usual capacity of the syringe is 2 c.c., and it is fitted with a push-on attachment, the needle sliding on to the syringe and not screwed on as is the case of the ordinary dental syringe. An adapter is made by which the ordinary aseptic needle can be used if it is desired, or an irido-platinum needle with the usual push-on mount is quite satisfactory. Probably an all-metal syringe is most satisfactory, and this is the opinion of Braun. Glass barrels will break at times even with the greatest care, and certainly all glass and metal syringes should be constructed so that a broken barrel can be replaced by the operator in a few minutes. It is wise to have two or three syringes in readiness, as much time is saved in this way.

It is desirable to have long and short needles, the long needle 45 mm., and the short one the length of the ordinary aseptic needle, about half that length. In my hands the irido-platinum needles have proved much more satisfactory than steel; I do not find irido-platinum needles too soft, although of course they need careful handling, and different makes certainly vary in rigidity. This is probably due to the varying proportions of the alloy.

Syringes and needles may be kept sterilized and ready for use in spirit; it is very convenient to have one syringe fitted with a short, and one with a long needle to avoid waste of time.

In addition to syringes and needles, I use small porcelain gallipots, which can be boiled and which are used as containers; graduated test tubes, for dissolving the solution; a flask containing Ringer's solution, and a flask containing sterile water for washing spirit out of the syringe and needle; tubes containing the drug in tablet form, and a pair of sterile conveying forceps.

THE INJECTING SOLUTION.

The drug I have used exclusively for mandibular anæsthesia is novocain combined with adrenalin or synthetic suprarenin. Owing to the difficulty of obtaining tablets until recently, I was compelled to have a solution made from novocain powder, of which fortunately, I possessed a considerable stock; to this solution I added adrenalin. Although my solutions were fairly fresh, the results were not so satisfactory as those I obtain from tablet solutions. I use a 2 per cent. solution in all cases, and generally suprarenin 1 in 20,000. Braun says that not more than 40 c.c. of a 2 per cent. solution should be injected—that is, 8 grm. For suprarenin the dose is given as 5 mg. At the Royal Infirmary, Leicester, where a good many major operations are performed under local anæsthesia, 20 c.c. of a 2 c.c. solution combined with adrenalin, of a considerably greater strength than 1 in 20,000, has been injected, and no toxic symptoms whatever were noticed. These are quantities far in excess of those which the dentist will require to use.

The toxicity of novocain in the doses used in ordinary dental practice is negligible; the question of novocain combined with suprarenin is somewhat different. Certain individuals show an extraordinary susceptibility to this drug, and in such cases it is wise to reduce the dosage. Thoma is also of this opinion, and strongly supports the view as to the advisability of keeping the proportion of suprarenin low. Fortunately it is easy to pick out cases of susceptibility as the symptoms show themselves almost immediately, and will subside if the syringe is quickly withdrawn.

Another point to be remembered is that the same patient may react quite differently to a similar dose on different occasions; this is not to be wondered at, when one considers how differently tobacco will affect the same person at different times. Further, I have remarked that the effects of the drug are nothing like so marked when the fluid is deposited in a space filled with areolar tissue as when the injection is made into the tense fibrous tissues of the gums or palate. There is even a greater reaction noticeable with Parrott's method of injection, especially when used in the lower jaw. I feel quite sure that all the toxic symptoms I have observed are referable to the hæmostatic agent and not to the anæsthetic drug.

The solution must of course be isotonic with the blood or nearly so, and it is found that the best results are obtained by dissolving tablets in 7 per cent. salt solution or in the modified Ringer's solution: Sodium chloride, 0·5 grm.; calcium chloride, 0·04 grm.; potassium chloride, 0·02 grm.; aqua destillata, 100 c.c. The tablets are of two kinds, E and F: E tablet contains novocain, 0·02 grm.; suprarenin synthetic, 0·05 grm. F tablet contains novocain, 0·05 grm. Tablet E when dissolved in 1 c.c. of normal saline, or Ringer's solution, makes a 2 per cent. isotonic solution of novocain and with $\frac{1}{20000}$ synthetic suprarenin. Tablet F when dissolved in 2·5 c.c. of normal saline or Ringer's solution makes a 2 per cent. isotonic solution of novocain. If it is desired to reduce the dose of suprarenin, it is only necessary to add a portion of the F solution to the E solution. Thus if 1 c.c. of F solution be added to 1 c.c. of E solution a 2 per cent. solution containing suprarenin $\frac{1}{40000}$ is obtained and by increasing the proportion of the E solution the suprarenin may be diluted to any extent. There is a growing tendency to reduce the proportion of suprarenin in solution and the strength of 1 in 20,000 is only recommended when profound anæmia is required.

The technique which is used for preparing a solution is as follows: Into a sterile test tube is poured 1 c.c. of Ringer's solution for each E tablet, or 2·5 c.c. of Ringer's solution for each F tablet, to be dissolved. The solution is heated to boiling point, and the tablet or tablets dropped in with sterile forceps. If less than $\frac{1}{20000}$ suprarenin is required, the E solution is diluted with the F solution to the required extent. The solution is then poured into the sterile container and taken up into the syringe, which has previously been thoroughly washed through with distilled water.

TECHNIQUE OF INJECTION.

The operator must be able exactly to visualize the anatomical structures into which he is about to plunge his needle. He must especially bear in mind that the point at which the needle should pierce the mucous membrane is on the internal oblique ridge and about 1 cm. above the occlusal surface of the last molar, and also that the internal surface of the ascending ramus of the mandible faces backwards as well as inwards. In some jaws this deflection is more marked than in others.

I will first describe the technique for injecting on the right side. The operator stands on the right and in front of the patient. With the forefinger of the left hand palpate the internal oblique line; now, still pressing, move the finger slightly externally, so that the mucous membrane is made tense over the ridge, and space is left for the needle to enter. Swab the field of injection with tincture of iodine to sterilize it. Hold the syringe in the right hand with a pen grasp, and plunge the needle sharply into the mucous membrane. It is important that the needle should be sharp, and that a quick stab should be made so that the puncture is as painless as possible; this puncture of the mucous membrane is often almost painless, and is usually not nearly so painful as in the case of injections nearer the gingival margins. The point of the needle should now be touching the bone at the internal oblique ridge; without moving the syringe gently release the tension exerted by the forefinger until the point of the needle is sufficiently internal to be free of the bone; now swing the barrel of the syringe to the right, and advance the needle. If it is desired to anæsthetize the lingual nerve, start injecting at once, but the great bulk of the solution, say 1·5 c.c., should be injected into the pterygo-mandibular fossa. Whilst advancing the needle be sure to keep in contact with the bone; when the correct point has been reached, about 2 cm. from the internal oblique line, the needle will come to a full stop and it will be found difficult to advance further; inject the rest of the solution slowly, moving the needle gently backwards and forwards so as to distribute the fluid and avoid injecting into vessels.

Difficulties.—In some mouths the palpation of the internal oblique line presents certain difficulties. This line can always be found by running the forefinger along the sulcus on the outer surface of the mandible until the external oblique line is felt; now advance the finger round the last molar tooth, and posterior to this tooth a triangular depression, the so-called retro-molar triangle, will be felt; the inner border of this triangle is the internal oblique line. The danger of perforating arteries or veins is *nil* if the technique is correctly followed, and in any case the puncture of an arterial or even venous wall is a matter of considerable difficulty at any time, and when it is lying in loose connective tissue, almost an impossibility. The great danger is that of injecting too low or too near the middle line; injecting too near the middle line can easily be avoided with care, as the landmarks are so clearly defined. The former is more easily done, and in certain jaws it is by no means easy to calculate the exact point of insertion, and the fact that the lower incisors may be well above the occlusal plane must be taken into account. It will be noticed in such cases that the needle does not enter so freely and that there is not the same definite point of contact with the bone as when the correct place of injection is reached.

Technique of Injection on the Left Side.—Stand behind the patient with the left arm around the patient's neck, and palpate the internal oblique line. Puncture the mucous membrane as before, and the procedure is the same as on the right side except that the syringe is swung to the right instead of the left.

RESULTS OF INJECTION.

If the injection has been correctly performed, the first symptom that the patient will notice is a feeling of numbness in the tongue and in the lower lip on the same side as the injection has taken place. If the whole of the fluid has been reserved for the inferior dental nerve, numbness of the tongue will probably be absent. A feeling of numbness in the lower lip is a sign that the injection has been successfully performed, and if it is absent successful anæthesia of the teeth cannot be hoped for.

The time required for full anæsthesia of the nerve varies considerably in different cases; usually the numbness in the lip is felt after about five minutes, and anæsthesia of the nerve is at its height in from fifteen minutes to half an hour. The teeth are anæsthetized in rotation from behind forwards, that is to say, molars first and incisors last; the duration of the anæsthesia is about forty-five minutes, and if operating upon several teeth it is wise to begin with the one most anterior, as the anæsthesia fades away in the reverse order to its onset.

If operating on incisors, an injection of 0·5 c.c. in the mental fossa upon the opposite side is often necessary owing to the communicating branches which cross the median line. For extractions it is also necessary to inject the long buccal nerve; 0·5 c.c. injected horizontally in the sulcus of the molar region is sufficient.

After thirty minutes has elapsed it is possible to cut simple cavities in any tooth in the lower jaw without pain; by simple cavities I mean cavities in which the nerve is not involved. Absolute anæsthesia of the nerve is present in many cases but not in all, but in practically all cases of successful injection the nerve can be freely exposed with no pain worth mentioning and then pressure anæsthesia applied.

If the periodontal membrane of a tooth is inflamed, the pain of the operation may be lessened, but it is not right to expect that it will be abolished. This applies to extraction as well as cavity cutting. If care be taken in cutting cavities there is no danger of exposing nerves, and so far from causing pulpitis I believe that there is less danger of pain in teeth filled under local anæsthesia, since the stimulation of the pulp and its resultant hyperæmia, which is present in operating on sensitive teeth without any anæsthetic, is in these cases entirely absent.

If the periodontal membrane and pulp be healthy, I have obtained uniformly good results by immediate filling; of course in the case of inlays this is impossible, as it is also in the case of two approximal cavities.

In my hands the best temporary filling has been proved to be oxysulphate of zinc; in very shallow cavities a little paraform may be mixed with it; temporary gutta-percha seems to leave the dentine hypersensitive. It is wise to line all permanent fillings with oxyphosphate, as the absence of sensitiveness may mask a nearly exposed pulp.

INJECTION AT THE MENTAL FORAMEN.

For the injection at the mental foramen again use the long needle. On the right side the operator stands behind the patient. With the forefinger of the left hand palpate the mental foramen on the cheek, and with the thumb evert the lower lip so as to expose the gum beneath the two bicuspids. Sterilize the mucous membrane as before, and at a point in the sulcus between the two teeth, insert the needle and carefully advance until the mental foramen is reached. This will be indicated by slight pain in the area of distribution—i.e., the lower lip. Inject a few drops immediately, and exert pressure with the forefinger so as to force the solution into the foramen. Now swing the syringe back as far as possible, so that the needle may be inclined downwards, forwards and inwards; advance the needle carefully into the foramen, injecting at the same time, and inject in all about 1·5 c.c. Withdraw the needle and massage the gum so as to squeeze the solution as much as possible into the foramen.

On the left side stand in front of the patient and proceed as on the right side; but in this case palpate the mental foramen with the thumb and evert the lip with the forefinger.

If the injection has been successful, anæsthesia of the canine, incisors, first bicuspid and sometimes second bicuspid should take effect almost immediately, so as to allow free cutting of the dentine and extirpation of the pulp. For extractions a lingual injection is necessary as well.

AFTER-PAIN FROM THE INJECTION.

If the mandibular injection has been correctly and aseptically performed, there should be no after-pain. The most common cause of after-pain is infiltration of the muscle fibres of the internal pterygoid by injecting too low down too high a percentage of suprarenin. Other causes may be (1) stale solution, due either to drugs which have become deteriorated before the solution was made up or to chemical changes which have taken place since the solution was made; (2) lack of asepsis in solution, needle or syringe ; or (3) septic condition of mucous membrane in which the puncture is made. This however is not a serious difficulty in the general application of local anæsthesia. It occurs but seldom, and if care be taken is never serious. The real difficulty, and the main objection raised by the patient, consists in the toxic symptoms which arise during the injection. These symptoms are due to deteriorated drugs, too high a percentage of suprarenin, and in some few cases the idiosyncrasy of the patient. In the hands of a thoroughly proficient anæsthetist these toxic symptoms should never be allowed to assume such proportion as to distress the patient. As soon as the first toxic symptoms become manifested by pallor, quickened pulse and respiration, the syringe should be withdrawn ; if, after the suprarenin is reduced to a minimum dose $\frac{1}{100000}$, the symptoms still persist, the case should be deemed unsuitable for local anæsthesia, but such cases are very few and far between. Symptoms that are truly toxic must be carefully differentiated from purely mental effects, which closely resemble them.

Mr. Loughnane, house surgeon at the Leicester Royal Infirmary, who has a wide experience in the use of novocain and adrenalin for general surgery, claims that he has never experienced any severe toxic symptoms in their use. He has injected as much as ten syringefuls of 2 per cent. novocain, each syringe containing 2 c.c. of the solution, that is 0·4 grm., and as much as 2 c.c. of $\frac{1}{1000}$ solution of adrenalin without any marked toxic effects. It is true that in all cases the patient was in a recumbent position, but we may safely conclude that the dentist need have no fear of the toxic effects of the comparatively small amount of the drugs he may inject. Personally I have never injected more than 5 c.c. of a 2 per cent. solution combined with adrenalin $\frac{1}{20000}$.

A colonial dentist, whom I know from personal experience to be a keen and conscientious observer in all dental matters, tells me that after considerable experience in the use of local anæsthetics both in Queensland, Australia, and in the North of Scotland, he considers the first symptoms which occur at the time of injection to be almost entirely mental. These symptoms he found to be much more marked in Australians, the inhabitants of a hot climate, than in the natives of the North of Scotland. He also experienced considerable help from the use of four or five drops of validol given in a wineglassful of water immediately before the operation.

With all deference to these observers, I am still of the opinion that the symptoms that occur on injection in the majority of cases are due to the action of the drugs used, and only in a very small minority of cases are they to be considered as purely mental. By diminishing the dose of suprarenin, I have found these symptoms much less frequently present; I have also observed that fresh solutions made from tablets and used immediately are less toxic than stock solutions which are of necessity comparatively stale.

PRACTICAL APPLICATION OF THE METHOD.

By far the most important application of mandibular anæsthesia, to my mind, is its use in the preparation of teeth for conservative work. For extractions we have a choice of anæsthetics—ether, nitrous oxide and oxygen, nitrous oxide alone and the local anæsthetics; the elimination of pain for the extraction of teeth is not one that seriously hampers the dentist in his daily work; indeed it may be said to have been solved.

Pain in conservative dentistry, if not the most difficult problem, is still one of the most difficult problems which confront the conscientious dentist in his daily work. I have had experience with the local application of ethyl chloride, the ether spray, various obtundents of which the most successful is paraform, the high-pressure syringe, Parrott's method of local anæsthesia, nitrous oxide, and oxygen analgesia; but none of these agents in my hands have proved anything like so efficient as conductive anæsthesia in the mandible. The more general application of some form of anæsthesia in conservative dentistry seems a natural step in the evolution of our specialty; how many teeth are sacrificed, or at best imperfectly filled, in deference to the humanity of the operator in dealing with sensitive tissues!

General surgery without anæsthetics is unthinkable, and the intelligent and skilful application of local anæsthesia will help to perfect the art of dentistry and stimulate that research which will one day make dentistry more truly a science.

I must not conclude without saying how much I owe in my preparation of this paper to the house surgeon and residents of the Leicester Royal Infirmary, to the curator of the Leicester Museum, who found me the specimens, and to the co-operation of the photographer.

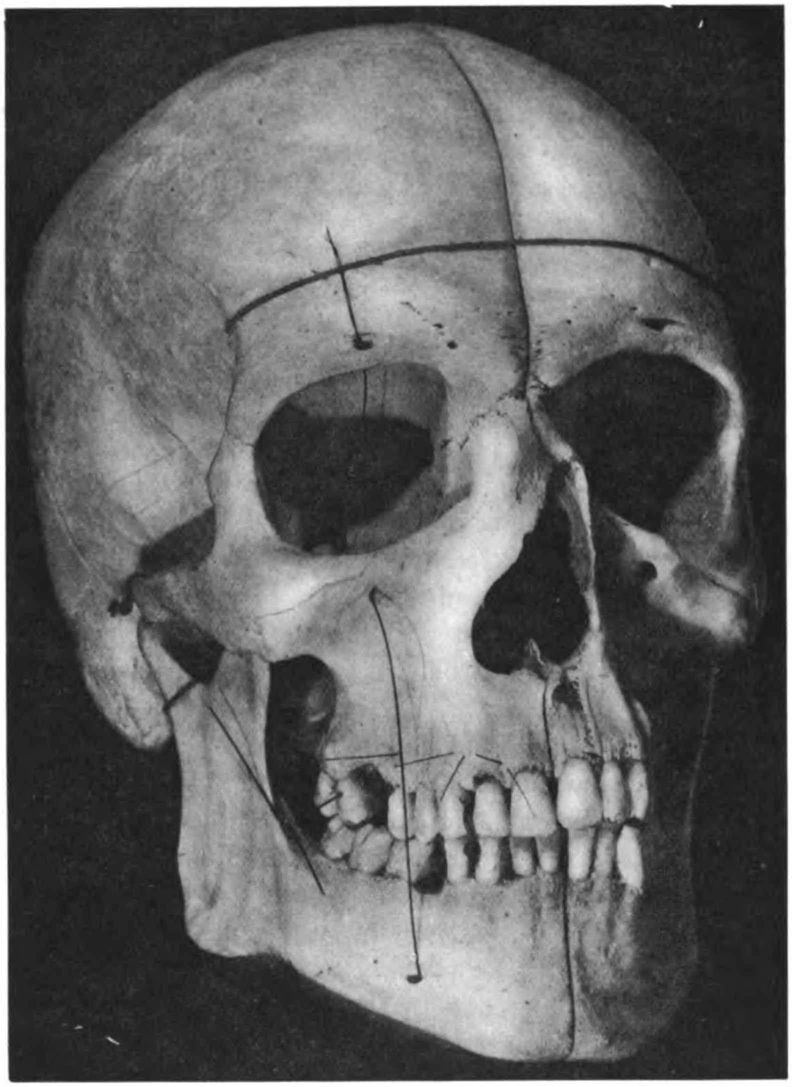

FIG. 1.

External view of skull showing mental foramen and sieve-like foramina at the alveolar border in the maxilla, important in infiltration anæsthesia. Note that the supra-orbital, infra-orbital, and mental foramina are in a direct line.

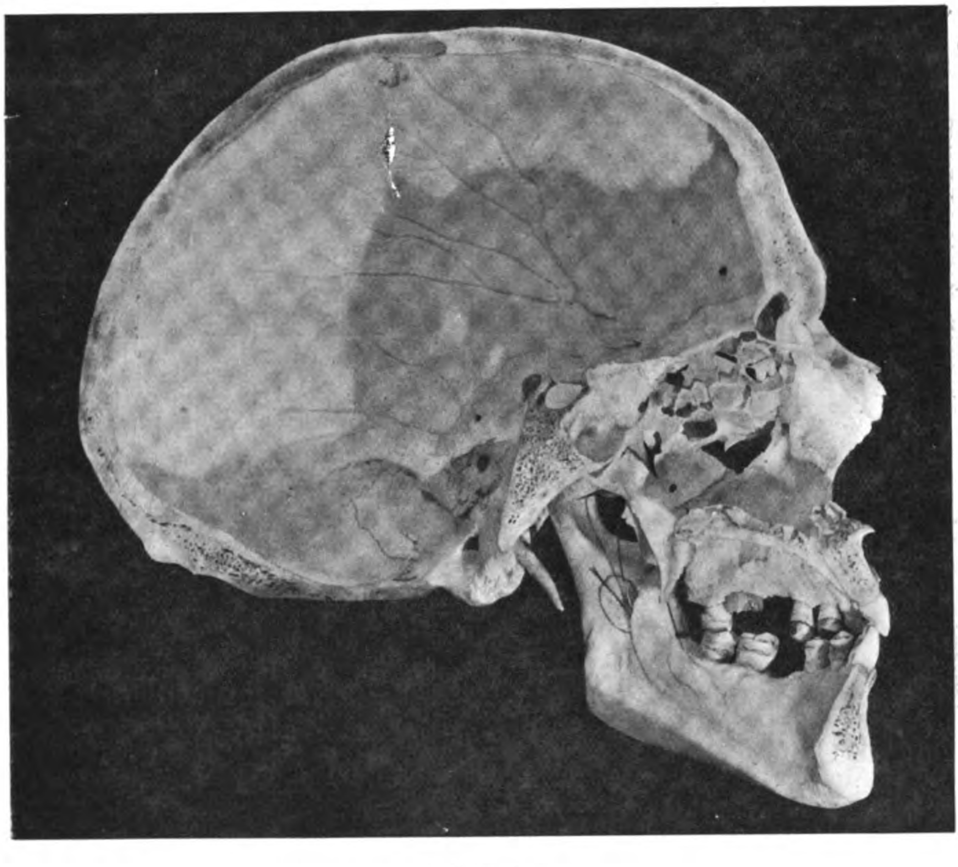

FIG. 2.

Internal view of skull: a bristle has been passed into the inferior dental foramen, and a line drawn marking the pterygo-mandibular fossa where the fluid is deposited in mandibular anæsthesia. Note also the internal oblique line and retro-molar fossa.

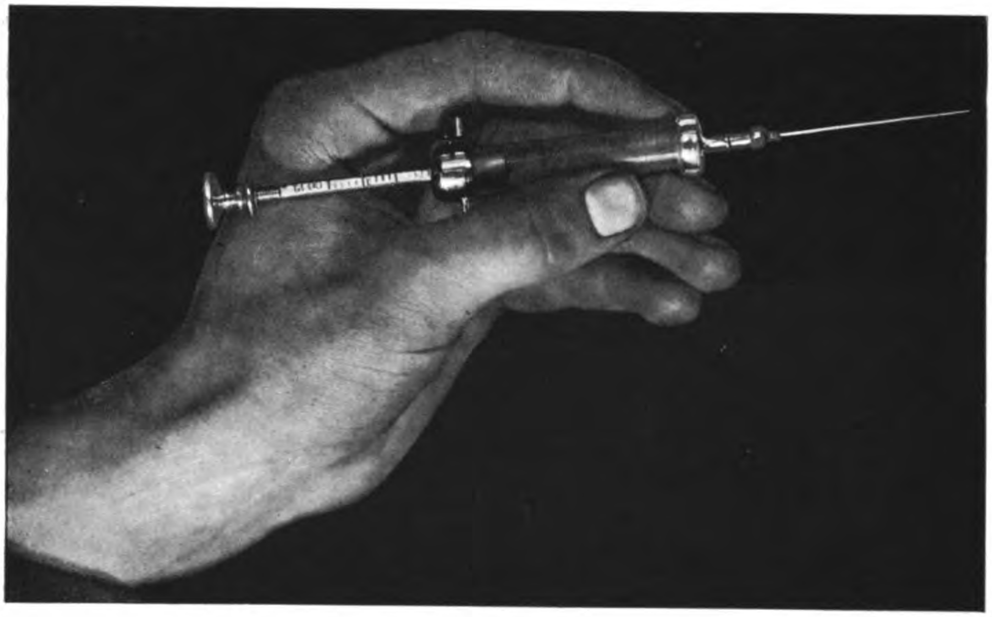

Fig. 3.

Method of holding the syringe for puncturing the mucous membrane in the injection for mandibular anæsthesia.

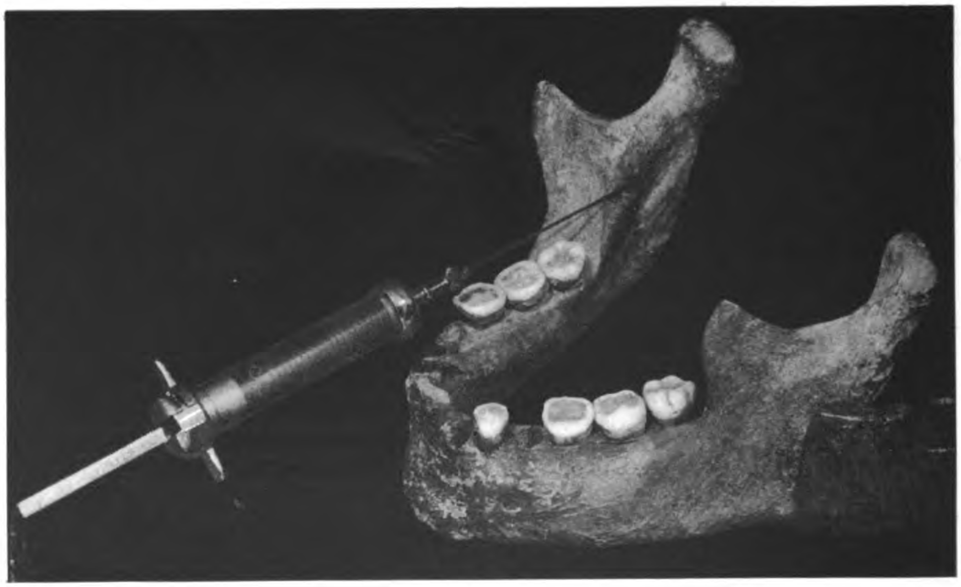

Fig. 4.

First position of the needle in injecting. The point of the needle should rest on the internal oblique line 1 cm. (½ in.) above the occlusal surface of the last molar tooth.

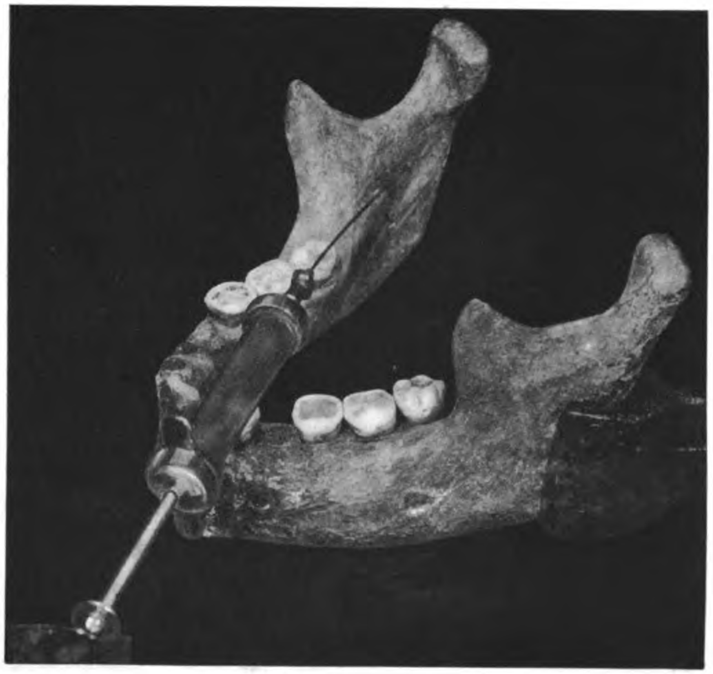

FIG. 5.

Final position of the needle which rests in the pterygo-mandibular fossa where the solution is discharged.

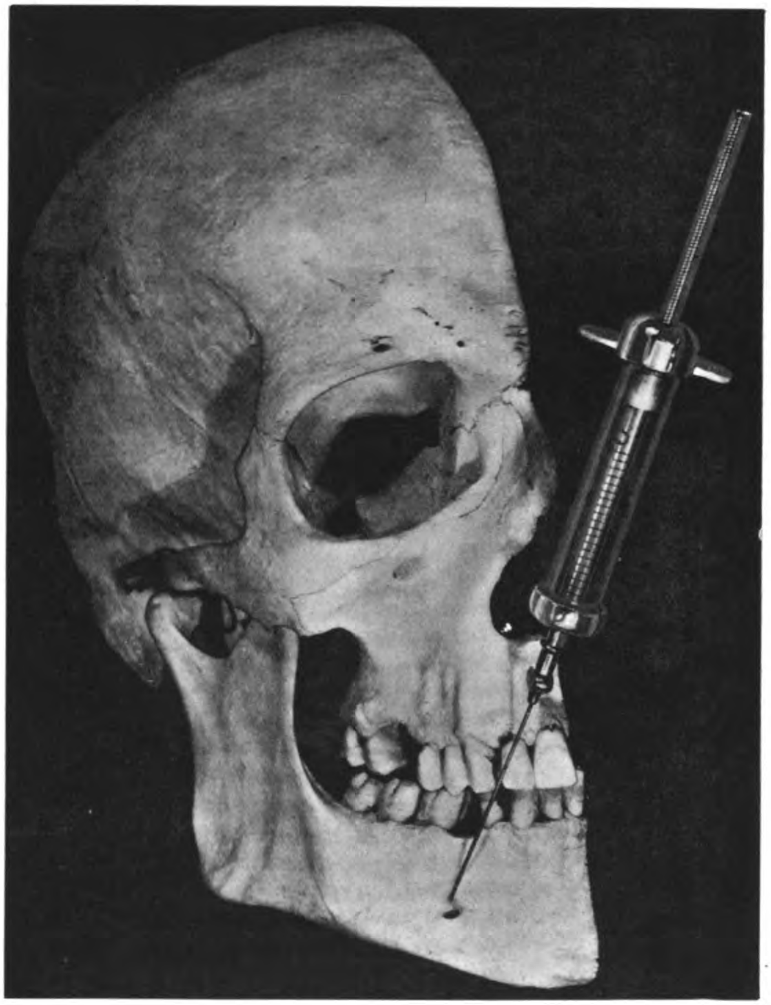

FIG. 6.

Position of syringe and needle in mental anæsthesia on the right side.

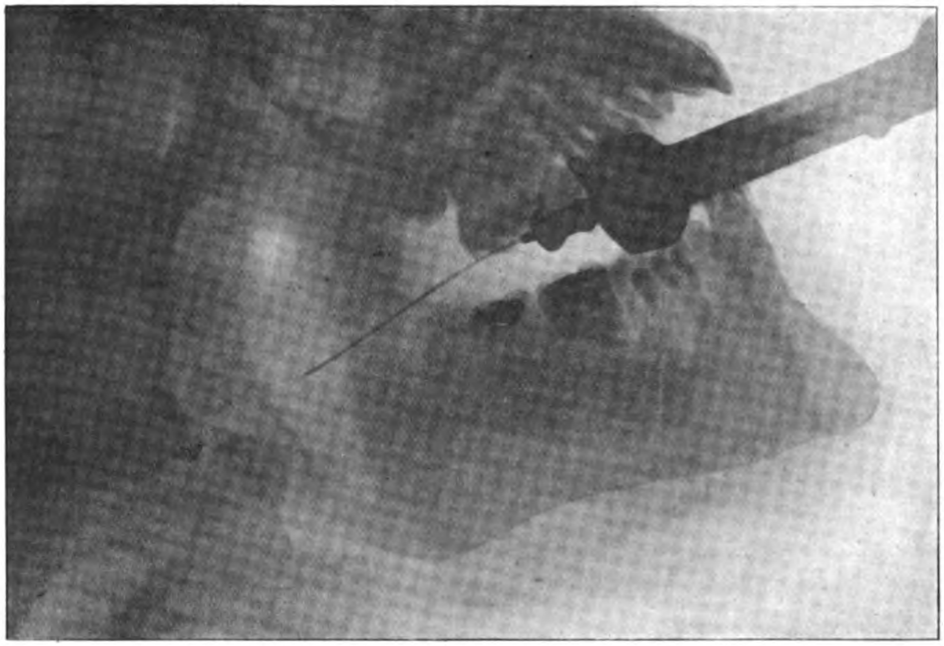

FIG. 7.

Radiograph of injecting for mandibular anæsthesia on the right side.

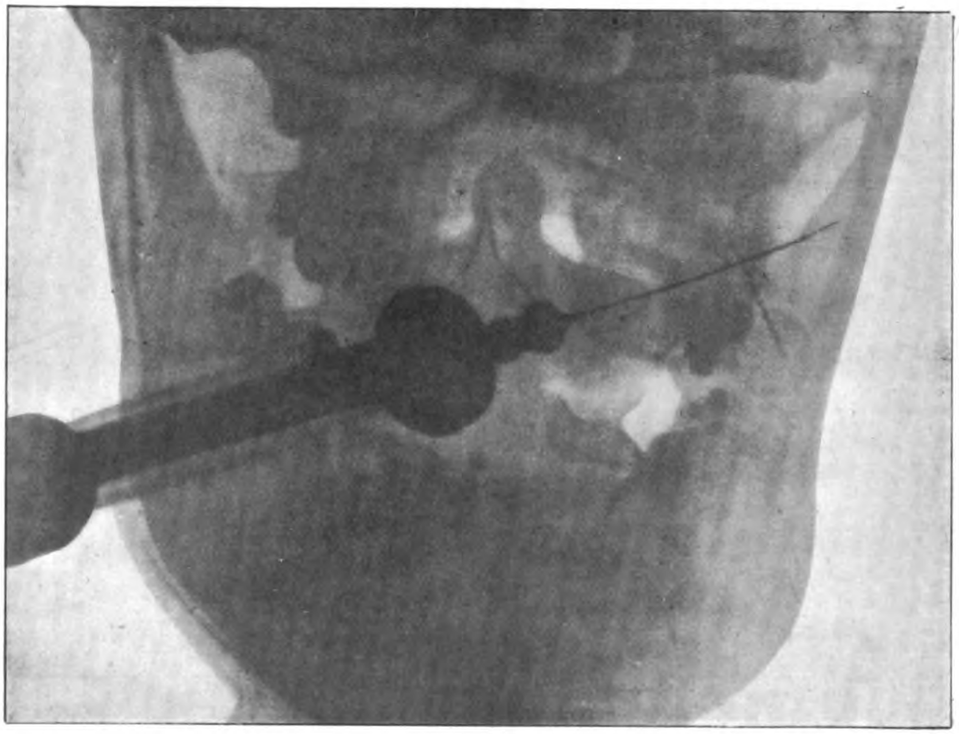

FIG. 8.

Radiograph of injecting for mandibular anæsthesia on the left side.

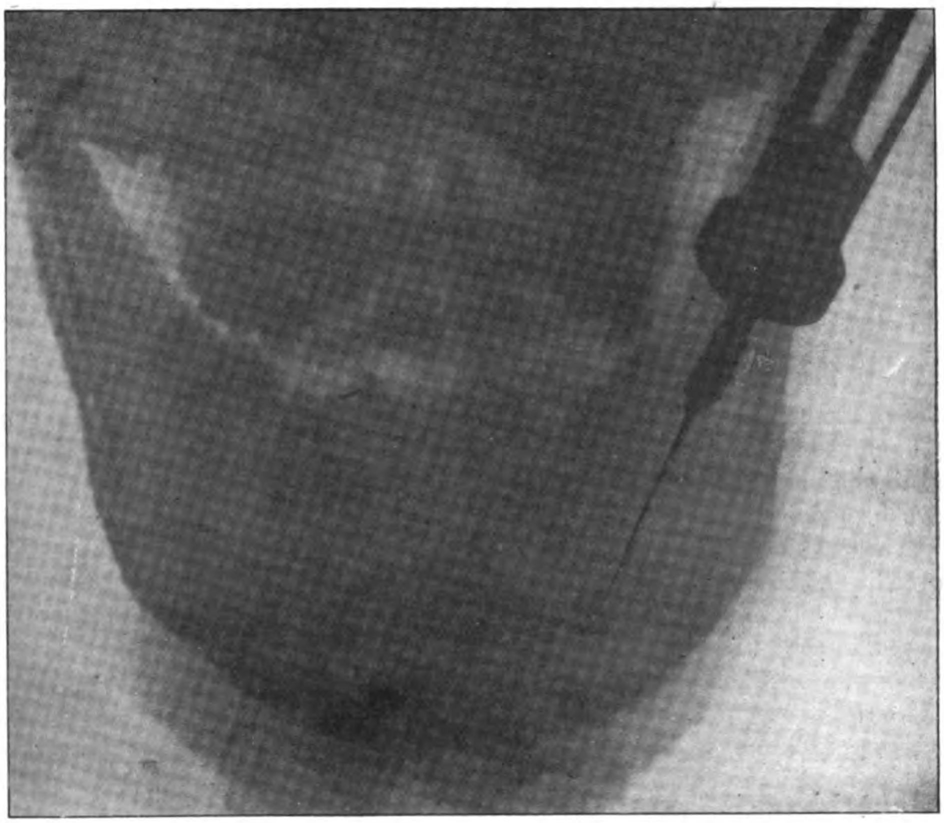

FIG. 9

Radiograph of injecting for mental anæsthesia on the left side.

DISCUSSION.

Mr. J. L. DUDLEY BUXTON: It might perhaps be of interest to cite my own experiences during the last two years. This method seems to me to be of particular value in dealing with war injuries—e.g., in cases when a minor operation is necessary, such as the removal of sequestra. My usual routine is to eliminate shock as far as possible in jaw cases—of which I have had some little experience—by the use of additional hypnotic drugs, as I am fully convinced that unless the operator can put out of his mind that he is dealing with a conscious person, even although he has satisfied himself that the analgesia is complete, he will not be able to perform a satisfactory operation. It is well known that, although a patient may feel absolutely nothing, yet he may say he is suffering agonies, and this should not be lost sight of. To prevent this I inject, subcutaneously, morphine tartrate ¼ gr., atropine sulphate $\frac{1}{100}$ gr. (scopolamine), hyoscine hydrobromide $\frac{1}{100}$ gr. In cases in which the patient is a healthy soldier one finds it necessary to give as much as ¼ gr. of morphia, in less healthy patients ⅙ gr. being sufficient. The reason for employing all three drugs together is that, although they all have grave disadvantages when used separately, yet given together they counteract in some respects—fortunately the undesirable respects—and aid in others by bringing about the effect desired, namely, "a general feeling of don't care"; further, a good deal of drowsiness is obtained. A patient may help by holding bowls and by answering questions during the operation, but subsequently is unable to give a lucid account of it (amnesia). After these drugs have been injected the patient is allowed to go to sleep in a slightly darkened room where no one will disturb him. Half-an-hour before the operation the novocain injection is performed. Vomiting has been reported after the use of hyoscine hydrobromide (scopolamine) by many experienced medical men, but if used in conjunction with morphia and atropine I have never known emesis to follow, even when a general anæsthetic has been administered subsequently. This latter procedure would be unwise after such doses of S.M.A. (scopolamine, morphia, atropine), as although atropine stimulates the respiratory centre, yet there is a great tendency for respiration to cease should a deep narcosis be obtained. I have heard of one case in which inframandibular injection had been performed, where the patient, a middle-aged woman, suddenly collapsed ten minutes afterwards. She could only speak in a whisper when she had recovered her faculties. This condition lasted for about two hours, when finally she recovered her voice. There was no apparent sign of any organic disease of the heart; the patient complained of a feeling as of a piece of string wound tightly round her throat, which became looser if she breathed gently. It was subsequently discovered that there was a leaking joint between the needle and syringe which would have allowed a few drops of novocain to trickle down the throat; this apparently would not be enough to cause such alarming symptoms, but it seemed a possible explanation, as only 1 c.c. of a 2 per cent. solution of novocain was the dose administered. Even at the early age of 6, children appear to be as good subjects for this method as adults, although one must bear in mind the different anatomical condition when injecting in the case of children. When there was some difficulty in obtaining novocain, I used beta-eucaine-lactate, employed in regional analgesia, though with only moderate success, although it is safe to use as high a percentage as 6 per cent. with this drug; but as a local analgesic the results were more favourable. Mr. Rowlett mentioned that unless novocain solution was freshly prepared from the tablets, it lost many of its valuable properties, and that it was unwise to use such a solution. About a year ago I had some ampoules of novocain sent me from Italy; I have used them just lately with success and without any trouble arising, but I certainly should hesitate to use novocain left over from the day before. The technique of this method requires to be fully mastered before success can be forthcoming, and above all things complete asepticity of instruments, solution, and hands is necessary. As regards alypin, in a case in which this drug was used in a very clean mouth, and with the utmost care to eliminate all septic dangers, pain with stiffness of the muscles and discomfort in swallowing occurred; this persisted for a fortnight from the time of the operation—the extraction of the second lower molar on the right side.

Mr. F. N. DOUBLEDAY: Mandibular anæsthesia was in frequent use during my period of study in Berlin eight years ago. Since then I have made little use of it on account of the fear of introducing sepsis too deeply into the neck as, for example, the region of the inferior dental foramen. I have often wondered what would happen if infection did occur, and have come to the conclusion that the best plan to overcome it would be the constant use of hot gargles to get the products of inflammation to the surface, perhaps as a post-pharyngeal abscess. During this war much use has been made of regional anæsthesia by Major Kazanjian at No. 20 General Hospital and by Mr. Dudley Buxton at King George Hospital, and the experience of these gentlemen confirms that of Mr. Rowlett that the risk of deep sepsis is small if proper precautions are taken. Before employing mandibular anæsthesia the German surgeons made a practice of giving their patients potassium bromide 15 minims.

The PRESIDENT: Before calling upon Mr. Rowlett to reply to the general discussion, may I ask him whether he aims at a penetration of the inferior dental nerve, and generally obtains it, or whether he is content with an injection of the cellular tissue in the immediate neighbourhood of the entry of the nerve into the mandibular canal? Mr. Rowlett has incidentally pointed out the liability of an undesirable and protracted anæsthetic effect to follow upon the use of a syringe which has been kept in methylated spirit, containing a drop of spirit at the moment of using. In corroboration, I am able to bear testimony to the value of injecting alcohol into the sheath of the inferior dental nerve as a means of relief and cure of severe trigeminal neuralgia affecting the area of supply by that branch, a cure which in one case has lasted for a period of at least two years to my knowledge.

Mr. A. E. ROWLETT (in reply): All authorities on local anæsthesia are strongly of the opinion that a freshly made solution is less toxic and has better anæsthetic qualities than a solution that has been kept for any length of time. Seidel declares that deterioration of the drugs begins to take place ten minutes after the solution is made. The pain and swelling after a correctly performed mandibular anæsthesia is very slight, and in a large number of cases it is entirely absent. I have obtained thoroughly good results enabling me to do permanent conservative work in a child aged 8. Complete anæsthesia takes place in all the teeth of the lower jaw in a period varying from twenty minutes to half an hour. A patient should be under supervision during that period. It is not intended to penetrate the inferior dental nerve, but to deposit the fluid in the pterygo-mandibular space around the nerve. Numbness of the lower lip on the same side as the injection, occurring about five minutes after injection, is a sure sign of a successful operation, and if this is not present success cannot be hoped for and the injection must be repeated.

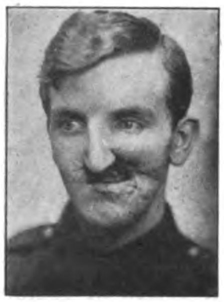

FIG. 1.

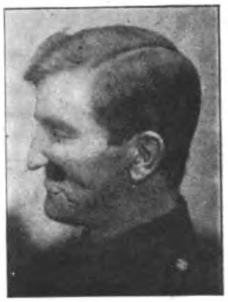

FIG. 2.

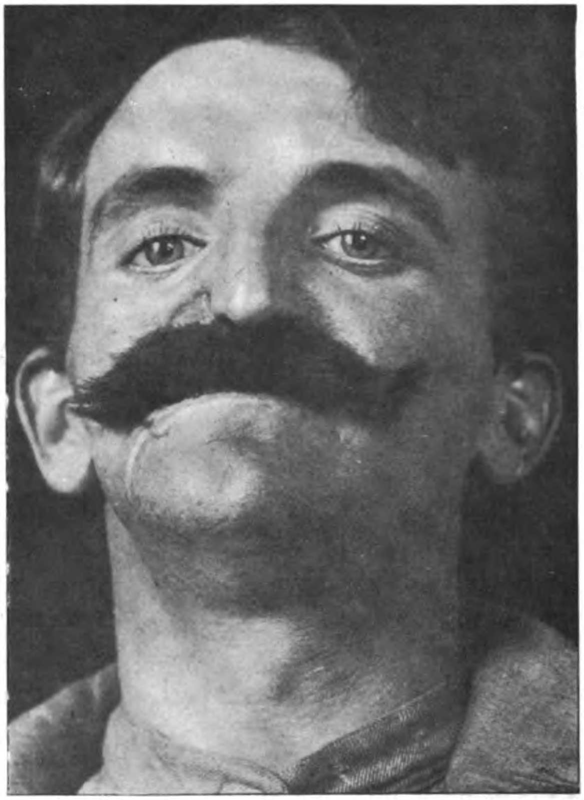

FIG. 3.

Illustrating Mr. J. Lewin Payne's case of facial restoration by means of a mechanical appliance (see pp. 17, 18).

Section of Odontology.

President—Mr. W. B. Paterson, F.R.C.S., L.D.S.Eng.

DEMONSTRATION OF CLINICAL CASES OF GUNSHOT INJURIES OF THE JAW AND FACE.

(*March* 26, 1917.)

Comminuted Fracture of the Mandible.

By G. Paton Pollitt.

This patient, aged 21, was wounded on the Somme on November 13, 1916, by either a rifle or machine-gun bullet, and was sent to Rouen, where no special dental treatment was undertaken. Nine days afterwards he was admitted to the King George Hospital, under Mr. Carson and Mr. Spokes—i.e., on November 22. I saw him on November 23. Radiographs were taken, and it was seen that he was suffering from a comminuted fracture of the mandible in the molar region on each side and at the symphysis (figs. 1 and 2). The wound of entry was on the left side in the molar region and the exit on the right; the injury of the soft tissues was not very great, but the mouth was very septic.

On November 24 he was given a general anæsthetic, and two roots of a lower first molar on the one side and the fractured first molar on the other were removed. An attempt was made under the anæsthetic to get an impression of all the lower teeth, but this was found impossible owing, first, to the large amount of swelling, and, secondly, to the fact that all the teeth with their attached portions of bone were so freely movable. Therefore, I took an impression later of the lower incisors and premolars and of the upper teeth (fig. 3). There was considerable displacement of the incisors and premolars; they were displaced downwards and inwards. The lower model was then divided and put in proper alignment and a cap splint made for both upper and lower incisors and premolars—i.e., the molars beyond the area of fracture on either side were not included in the splint.

Both splints were cemented into place on December 12, the fracture at the symphysis being reduced at the same time. Both splints had hooks on the labial surface. The splints were wired the next day, the lower incisors being drawn up into fairly good articulation, the procedure being simple owing to the mobility of the parts. The molars in the mandible were not displaced much in relation to the upper teeth, so that by immobilizing the front teeth these were held more or less firmly in their right articulation. The splints came off once or twice and were recemented.

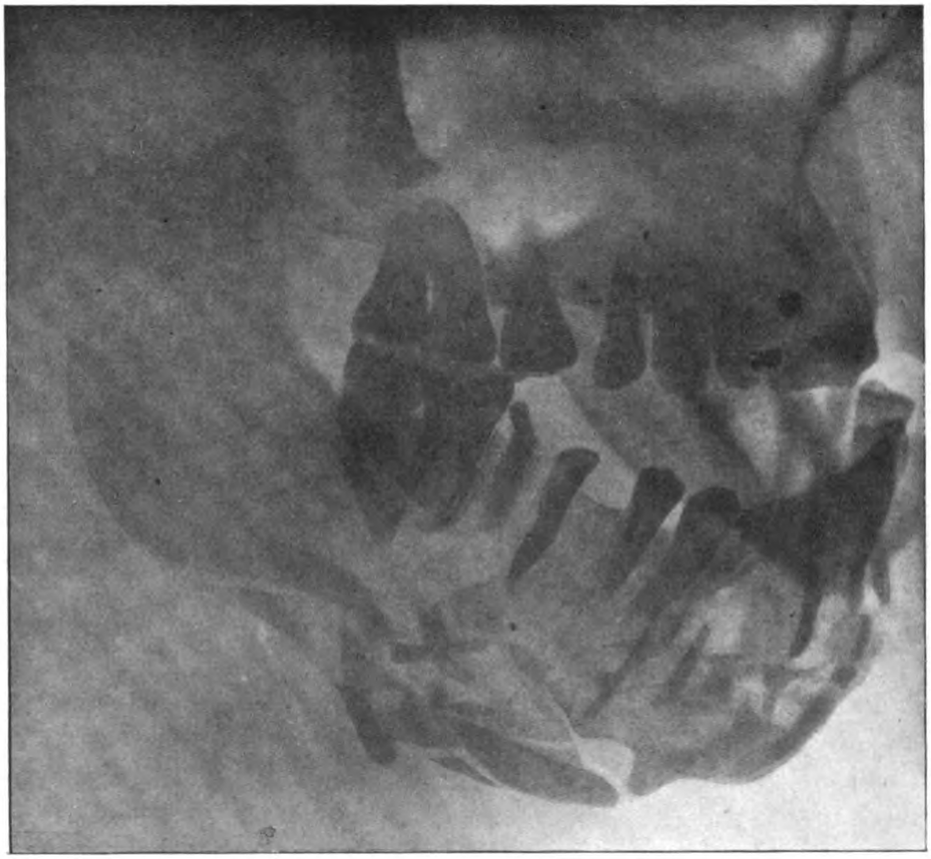

FIG. 1.

Right side.

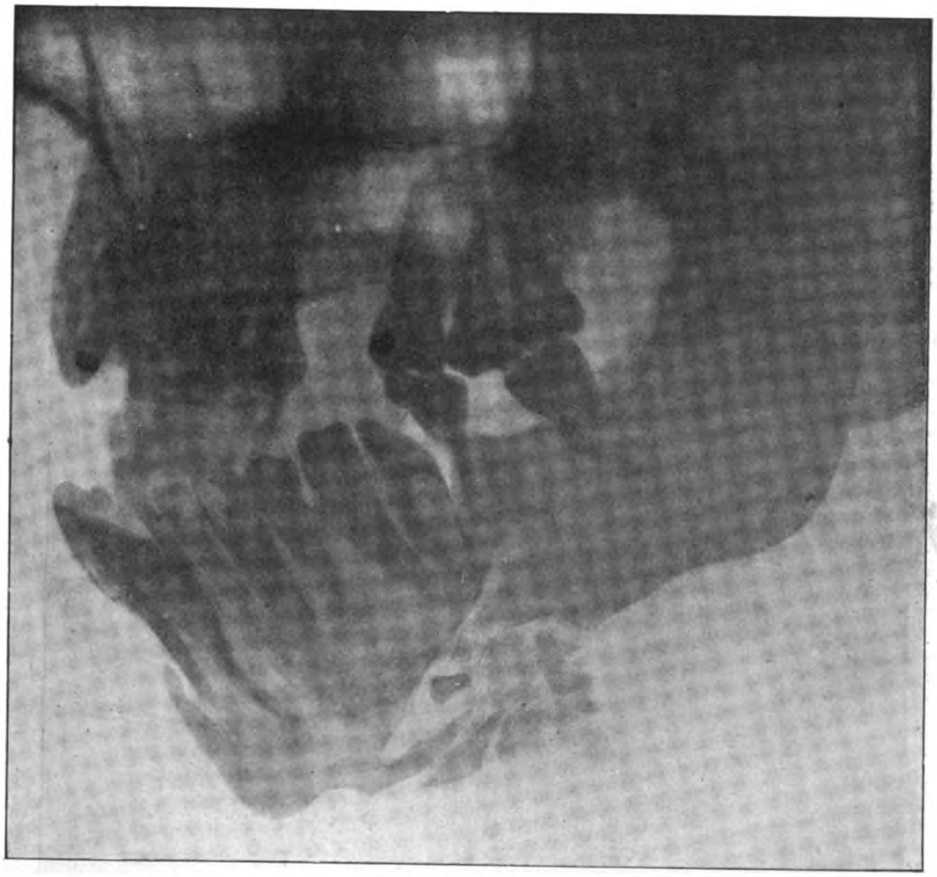

FIG. 2.
Left side.

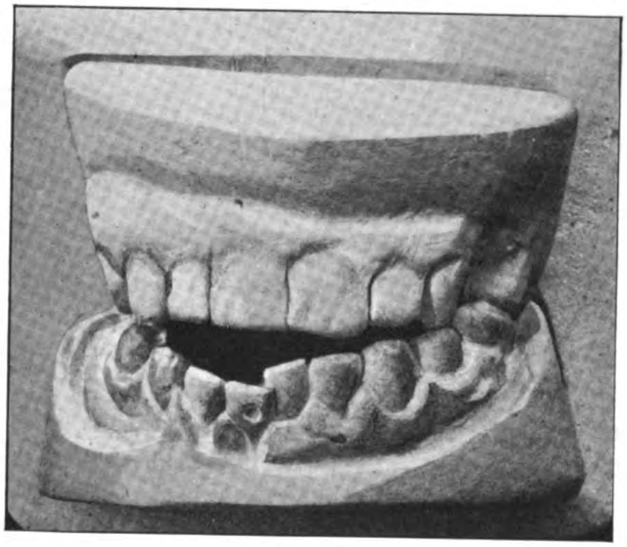

FIG. 3.

On February 19 the patient was sent to the Auxiliary Hospital and readmitted on March 2 for examination, when the splints were removed and radiographs taken (figs. 4 and 5).

I propose now to put on a cap splint covering all the lower teeth, with a partial cap for the upper front teeth merely as a rest for the bite; the articulation is quite good, and with a little grinding of the molars later will be practically normal. The fracture at the symphysis is quite firm, the right central incisor being dead. There

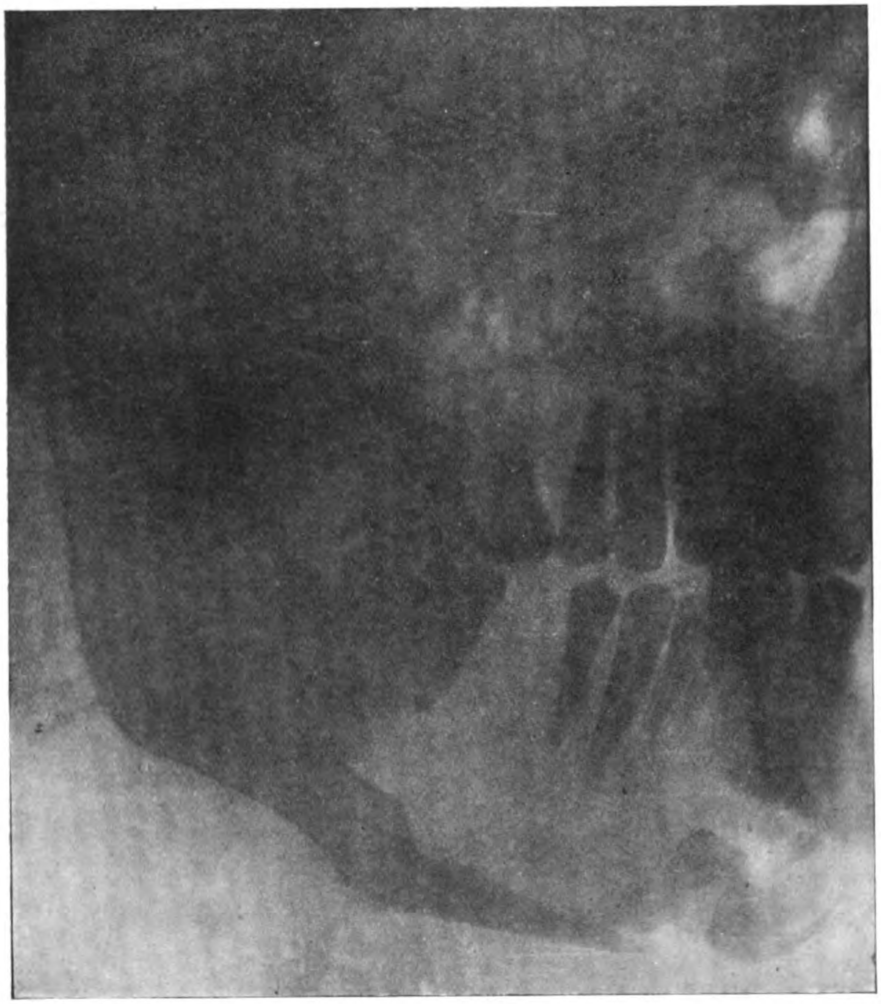

FIG. 4.

Right side.

is no suppuration. In the molar region on the left the solidification is very good also, and there is no suppuration, but there is slight movement on the right side and slight external suppuration.

I think that the interest in the case lies in the amount of solidification that has taken place during the three months that he has been under treatment; and it helps to show us that one must not be in too great a hurry to extract teeth in a line of fracture or implicated in the comminuted areas. In this case had I wished to take out the teeth implicated in the fracture, it would have meant the extraction of a large

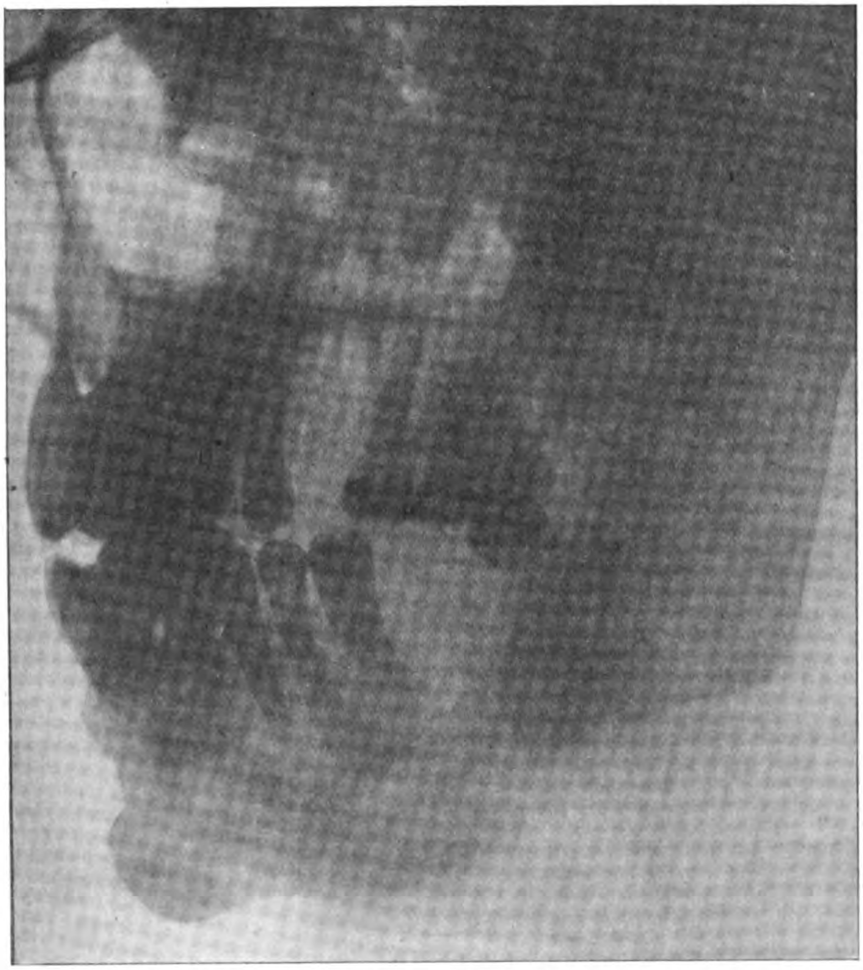

FIG. 5.
Left side.

number, as there was a definite transverse fracture in the alveolus, in the region of the left incisors and premolars, these teeth, with the alveolus, being extremely loose.

In spite of his being wired up, and of the sepsis in the mouth, the patient has done extremely well, and we were able to keep his mouth sufficiently clean. He was unwired now and then and the mouth cleaned and swabbed with 2 per cent. of iodine, and the opportunity was also taken of doing this when the splints came off.

The points to which I wish to draw attention are:—

(1) The fact that the molars were not included in the splints.

(2) That practically no teeth were extracted as being included in the fractured area, because they were most of them implicated.

(3) The amount of new bone formation during the three months that the splints were *in situ*.

(*March* 26, 1917.)

Report on Treatment of a Case of Shrapnel Wound of the Mandible, in which Bony Union was re-established after great loss of Substance.

By B. MAXWELL STEPHENS.

THE treatment of this case, originally, was carried out in conjunction with Mr. Cyril Nitch.

The patient, a Canadian, aged 19, was wounded on October 12, 1916, and received on October 23, at the Facial Hospital, Brook Street, London. He was then in a marked state of collapse. There was a small wound in his right cheek and a larger one in his left; the anterior portion of the mandible hung loosely forward so that only with great difficulty could he close his lips; speech was impossible for several days. Fragments of shrapnel had struck the lower border of the mandible on the right side, entered the mouth, ploughing through the sublingual region and emerging through the left cheek just anterior to the opening of the parotid duct. On the right side immediately anterior to the first bicuspid a line of fracture ran obliquely downwards. Above the symphysis menti there lay an extensive area of comminution, bounded on the left by a second line of fracture in the bicuspid region; beyond that, just anterior to the second molar, was situated a third line of fracture. The teeth between the right lower second bicuspid and the left lower second molar with the alveolus which supported them were missing. All the teeth in the upper jaw were present and uninjured. The mouth was cleansed and swabbed with tincture of iodine and a tongue scraper used. Irrigation with saline solution from a portable pneumatic tank was effected every two hours in the day and as the patient at first slept badly, at the same intervals during the night. In three days the condition of the man had considerably improved.

On October 27, under a general anæsthetic, a sequestrum was removed from the neighbourhood of the fracture on the left and pendant drainage established in the median line of the mouth; through the same incision also as that made for the drainage, was passed a second and longer tube, the extremities of which were attached to a rod maintained vertically before the mouth. This rod was held in the middle line by a horizontal bar attached to ear pieces suspended from a head cap. By this means an attempt was made to support the loosely hanging portion of the jaw.

On November 8 secondary hæmorrhage occurred; in searching for the source it became necessary to separate and remove the largest fragment of bone lying between the lines of fracture. The possibility of its union occurring with the body of the ramus on the right was indicated by a large mass of callus which had been deposited at that extremity of the fragment. The fragment removed measured 47 mm. along the inferior border and 15 mm. in depth. Control of the hæmorrhage was obtained by suturing a lint pad within to two short lengths of rubber tubing placed against the skin. After thirty-six hours the pad was removed and no hæmorrhage recurred. It is worth noting that the patient subsequently exhibited a marked hæmorrhagic tendency on more than one occasion. After the removal of this remaining fragment from the fracture, the rami swung towards each other, crowding on to the tongue; on the left side the lower second molar was therefore wired to the corresponding tooth in the maxilla, and on the right side a small intermaxillary wire splint was fixed.

On December 6 a permanent splint was fixed; its form can be followed in the second radiogram (fig. 2). From either side bars of German silver, rectangular in section, made in two halves, spring from attachments fixed to the remaining teeth. These bars are carried round the line of the alveolus till they meet and considerably overlap. When the attachments had been fixed in position the opposite sides of the mandible were moved apart from each other and the bars wired firmly together in that position. At the end of a week callus was found to be depositing; the wiring was then removed and the parts forced still further outwards; effective occlusion having been secured between the upper and lower teeth, the bars were rewired in the new position. At the same time a removable vulcanite pad was attached to the bars to stretch the scar in

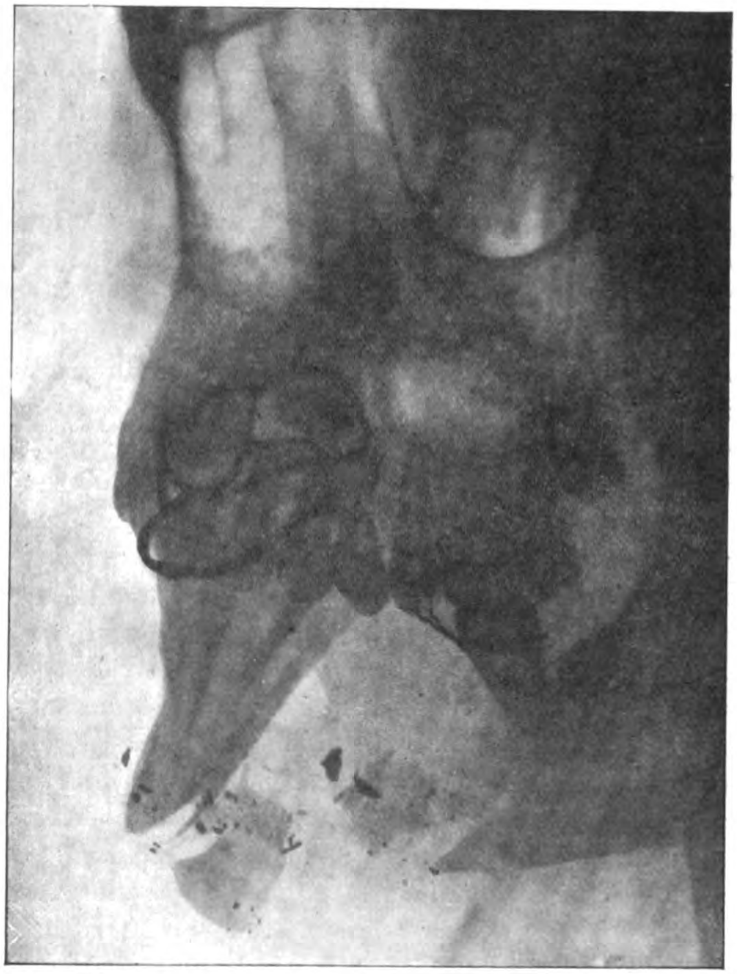

FIG. 1.

Skiagram taken by Mr. C. A. Clark on November 20, 1916. The interfragmental region is shown. The mandibular teeth are temporarily secured to those in the maxilla.

the left cheek and prevent the lip falling in. It is convenient to mention here that to avoid the formation of a depressed scar, massage was applied daily to the cheek for two months. The deposit of callus steadily continued. A small sinus however was found to have persisted in a position situated anteriorly and lingually to the molar on the left side. When explored it was found to lead directly downwards to the interfragmental area, but no cause for its persistence could be located.

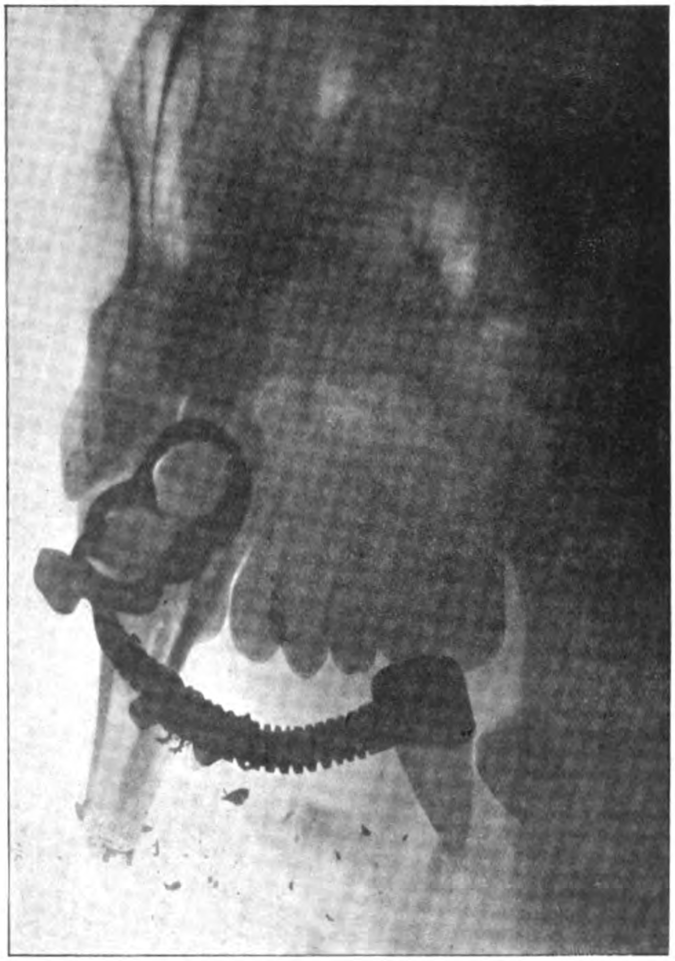

FIG. 2.

Skiagram taken on March 22, 1917, by Mr. C. A. Clark. Density of callus very slight. Form of splint is shown.

On March 22, therefore, further stereoscopic radiograms were taken;

one of the pair is reproduced herewith (fig. 2), and shows that the callus has bridged the space entirely except at one spot on the left side in the neighbourhood of the sinus. The foregoing is the history of the case up to date. As the apical condition of the molar on the left now appears to be doubtful, it has practically been decided to remove it; before this is done, however, it is felt that it will be wise to further explore the sinus under local anæsthesia.

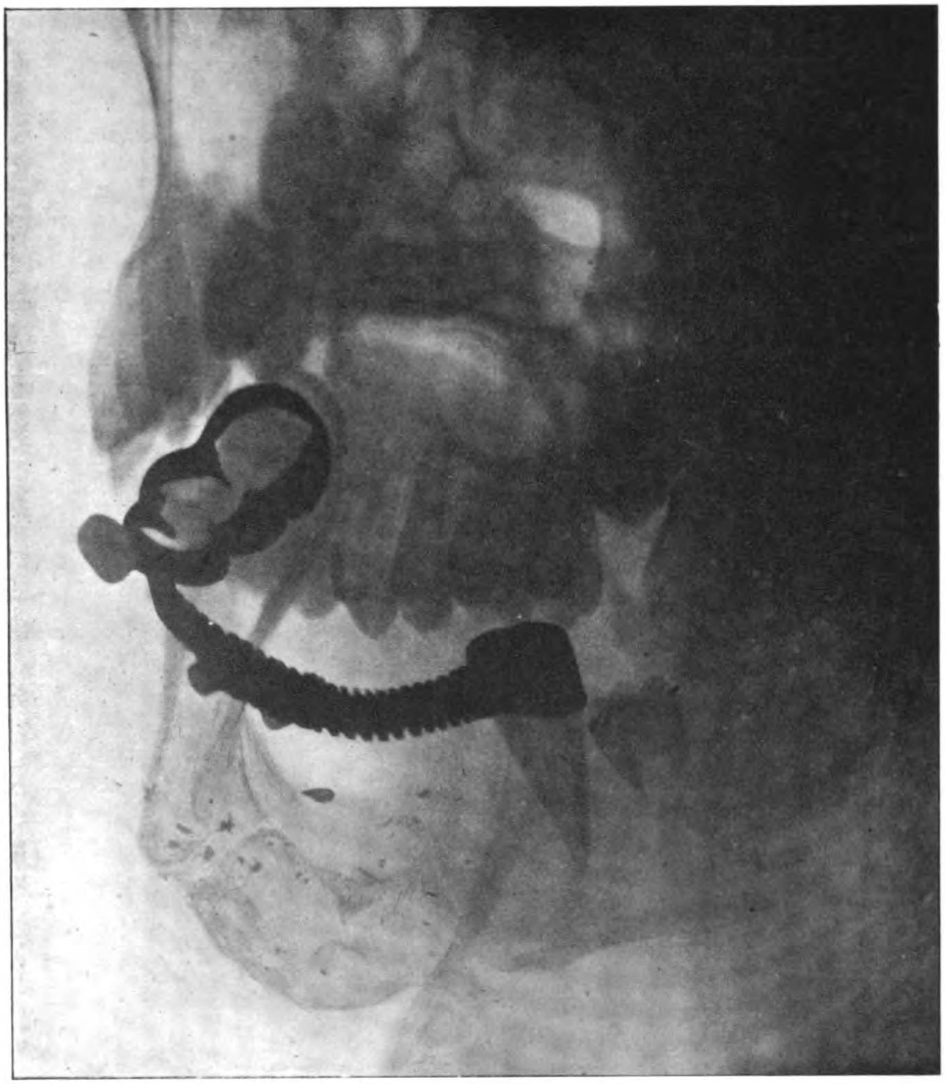

FIG. 3.

Skiagram taken on May 15, 1917. Bony union has been established.

Note.—Since reporting the above, I have fortunately been able to find the apex of a tooth in the sinus above referred to; the molar tooth has therefore been spared. The bony union which has now been secured I consider has been helped by a daily application of high frequency electric current. The splints are now off and a heavy tin denture has been made and inserted. The man masticates well and will be recommended for active service again.

(*March* 26, 1917.)

Cases of Gunshot Injury of the Face and Jaw, with Special Reference to Treatment.

By F. N. DOUBLEDAY.

THE first of my cases is that of an Australian, Private G. He had an extensive loss of tissue of the left cheek. This was successfully dealt with by a plastic operation. After the operation a dense mass of scar tissue formed in the cheek, which prevented him from opening his mouth and greatly hindered the treatment of his jaw injury. In order to soften his scar and render it more pliable he has been treated for three months with Dowsing heat and, as those of you who have examined him will have observed, the scar is now fairly supple, and he can open his mouth freely. The heat is applied for fifteen minutes daily, a 50-candle power lamp being placed about 6 in. from the patient's face and the rays interrupted by the hand of the nurse being passed to and fro between the lamp and the patient's face. This treatment we have employed for several cases where excision of the scar was, for various reasons, undesirable, and always with most satisfactory results.

I will now give you a brief account of the other cases which you have already examined in the clinical room. The first is that of Private S., who was wounded on July 13, 1916, and admitted to King George Hospital on July 18, 1916. On admission the patient had a wound of entry just below the zygoma on the left side; the bullet had travelled down towards the chin, fracturing the maxilla and mandible. There was a large open, septic wound in the region of the chin on the left side and an open wound through into the mouth. Part of the mandible in the left canine region was missing; the left fragment was internal to, and overlapped by, the right fragment to the extent of nearly an inch. There was also a fracture of the right horizontal ramus of the mandible and a wound of the left hand. The following teeth were remaining:—

$$\begin{array}{cccccccc|cccccccc} 8 & & & & & & & & & & & & & & & 8 \\ \hline 8 & & & & 4 & 3 & 2 & 1 & & 2 & 3 & 4 & 5 & & & \end{array}$$

The lower left incisor and a piece of shell were found between the fragments when an anæsthetic was administered. The skiagraphic report showed that there was a double fracture in the canine region extending back into the premolar region upon the left side. At first an attempt was made to retain the lower front teeth and, by applying a splint to them, to reduce the displacement of the bone. But the persistent suppuration and the failure of the teeth to tighten up made me feel that they were only hindering the treatment of the case, so that on August 18 these teeth were extracted with great reluctance and considerable fear as to the ultimate result, from total loss of any support for a splint. As the fracture was not yet united I feared that the displacement would recur, but this did not prove to be the case: a good deal of necrosis went on, and the sinuses were reopened and scraped on August 18 and again on September 5 and 17, but by the end of September it was evident that firm union was beginning to occur. As late as January 27, 1917, some small spicules of bone were exfoliating, but at the present time the patient has a firm bony union of his jaw without any other deformity than that of a rather flat floor to his mouth.

The second case, that of Private L., is of a similar but more severe character, as will be seen from the diagrams (figs. 1 and 2). There were several fissured fractures running across the maxilla, and at least four fractures in the mandible. Almost all the teeth were standing, but were loose and moving about, both with the fragment and within their attachment to it. Here, as in the first case, I was reluctantly driven to extract all the teeth, fearing all the time that serious displacement would ensue which it would be difficult or impossible to overcome when there were no teeth from which anchorage could be secured. Fortunately, however, this fear proved to be groundless, for, as those of you who have examined the patient will have found, there is perfectly good bony union and no displacement.

In both these cases the removal of the teeth was so extensive as to render the use of a splint impossible. Any temporizing measures would have been useless owing to the extensive nature of the injuries. Yet in both cases, as you have seen for yourselves, perfectly satisfactory bony union has ensued without displacement.

The third case is that of Private K., who was wounded on August 20, 1916, and admitted to King George Hospital on September 3, 1916. On admission he was found to have a fracture on the left side of the mandible in the region of the first molar; there was an external wound discharging pus freely. There was a scalp wound in the left parietal region going down to the bone. A double wire splint united by ligatures had been inserted in France. There was at first, as is so usual in these cases, a good deal of discharge from the wound and some necrosis. The case dragged on, and by December no bony union had occurred. The wire splints were therefore removed, the second premolar and first molar on the left side were removed, and a double cap splint, united by wiring, inserted. At the same time the external sinuses were opened and scraped. Within six weeks firm bony union

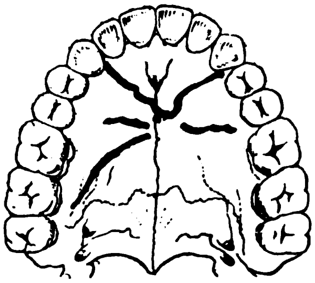

FIG. 1.

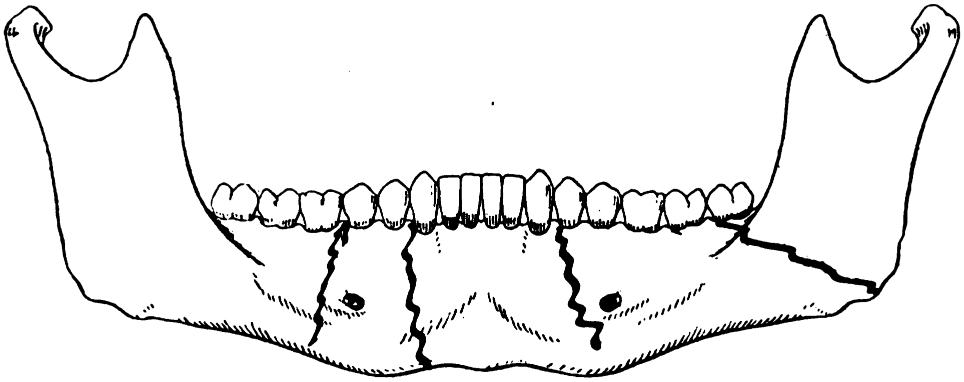

FIG. 2.

had occurred, and all discharge had ceased; a pretty clear indication as to what should have been the line of treatment from the beginning.

The fourth case, that of Private O., is of interest because there arose the question of the amount of tissue which can be bridged over by new bone. The patient was wounded on July 14, 1916, by shrapnel; nearly an inch of the entire depth of the bone in the region of the symphysis was shot away (figs. 3 and 4). The patient was admitted to King George Hospital on July 21. There was then so much swelling and discharge of pus that the only treatment adopted was to provide free drainage and to relieve the patient's pain by wiring the upper and lower teeth together. By August 7 he had improved sufficiently to have a cap splint applied to the remaining teeth—the canine and two premolars upon the right side and the canine and first premolar upon the left side. The halves of the mandible showed a good deal of tendency to fall in towards the middle line; owing to the unopposed action of the external and internal pterygoid and the mylo-hyoid muscles there was a considerable tendency at first for the splint to work off. By December there was some bone along what had been the inferior margin of the mandible, but the union was not firm enough to allow any pressure to be put upon it and the two halves of the jaw were movable upon each other with firm pressure. The splints were reapplied and at the present time, six months after the injury, I believe you will allow that the patient has a good firm bridge of bone formed across the gap and that there is no apparent deformity. With the help of a denture I believe that this patient will shortly be able to masticate hard food quite well.

The points that I wish to raise in connexion with these cases are as follows: First, the value of radiant heat as a means of making scar tissue supple; it appears to me to be a simple and effective method of treatment. Secondly, in these cases, where very extensive comminuted fractures have resulted from gunshot injuries, the satisfactory results which have followed the extensive extraction of teeth. Thirdly, as to the best type of splint for use in these gunshot injuries of the jaws. Personally I believe that the cap splint is by far the most satisfactory appliance. In most cases I use a double cap splint, cemented to the upper and lower teeth with oxyphosphate of copper cement; the copper is an excellent antiseptic. To these splints stout hooks are attached and the jaws are immobilized by wiring them together with brass wire. By this means absolute immobility is secured, and if it is desired to open the mouth to clean it, or to ascertain the progress of the case, it is easily done by cutting the brass wire and then rewiring after the examination

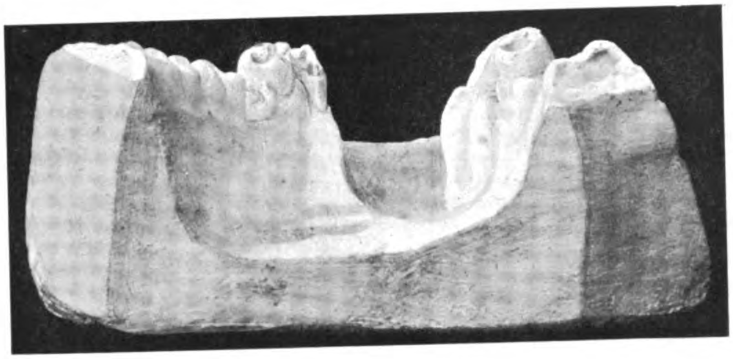

FIG. 3.

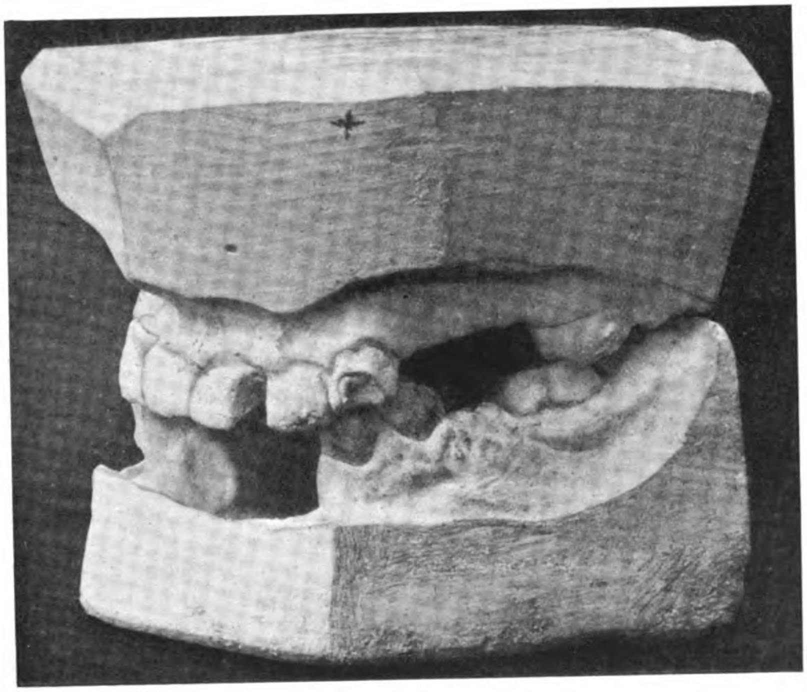

FIG. 4.

is complete. This type of splint seems to me simple, clean, and efficient. Fourthly, what are the essentials of treatment? I believe that drainage comes first and immobilization of the jaws second. By drainage I mean opening up and scraping the sinuses from time to time, much as one would treat a septic tooth socket which refuses to granulate from the bottom. By this means we encourage the separation of small sequestra, but do not run the risk of removing larger pieces of bone which may be sufficiently nourished by the serum, or by flaps of periosteum to live and form new centres for osteogenesis. I cannot too strongly deprecate the opening and scraping of the wound and the removal of bone on an extensive scale by the surgeon. If this means of treatment had been adopted in Case IV the patient would certainly not have obtained such a good jaw as he now has. In the early stages of the case it is impossible to tell which fragments of bone will live and which will die. The apparent presence of loose bone in the skiagram means nothing; to remove it by operation is disastrous; the only safe procedure is to wait for it to separate and exfoliate and then to remove it six or eight weeks after the injury. The next essential appears to me to be to promote immobility of the jaws and so to secure absolute rest. These soldier patients are strong hearty fellows, and to tell them not to use their jaws for hard food is useless unless they are prevented from doing so by the fixity of the splint, and I believe that free drainage followed by a period of absolute rest secures the most speedy and satisfactory results.

CORRIGENDUM.—On p. 23, line 14 (Rowlett, "Mandibular Anæsthesia"), read "8 mgr." instead of "8 grm."

Section of Ophthalmology.

President—Mr. WILLIAM LANG, F.R.C.S.

(*November* 1, 1916.)

Congenital Pigmentation of the Optic Disk.

By G. WINFIELD ROLL, F.R.C.S.

AN elderly police pensioner consulted me at the Royal Westminster Ophthalmic Hospital at the instance of Dr. W. Evans. He is the subject of glycosuria and has well-marked retinitis diabetica in the right eye, the vision of which is defective, owing to macular exudates and hæmorrhages. The left eye has good visual acuity, $\frac{6}{9}$; the optic disk is normal in outline and arrangement of retinal vessels; its colour is uniformly inky black, forming a remarkable contrast to the surrounding fundus.

I believe the condition to be congenital owing to the even distribution of the tint of the optic disk. A similar appearance of an optic disk has never hitherto come under my observation; a few instances of a somewhat similar condition are on record. I exhibit a sketch in colour of the abnormality.

(*November* 1, 1916.)

Pigmented Plaque in Corneo-scleral Junction ; ? Nature.

By LESLIE PATON, F.R.C.S.

PATIENT is a girl, aged 7. The condition was noticed first by her mother about seven weeks ago. It consists of a small pigmented area at the junction of cornea and sclera of left eye, about 2 mm. in diameter and brown in colour, with a slightly darker centre. The fibres of the iris in the sector corresponding are slightly pushed forward as if by underlying growth. When the pupil is dilated, however, no definite growth can be seen.

I have brought this case up for the opinion of the Section, because I have not previously seen a case exactly like it. I shall be glad if anyone can throw light on its nature. The mother is quite sure there has been no injury.

DISCUSSION.

Mr. STEPHEN MAYOU: In the centre of the black part of the mass there is a little grey spot, and it looks as if the iris fibres were drawn forward to it and adherent to the back of the cornea. If I had seen this case and did not know the history, I should have said that the child had had a perforating injury there, and that, in consequence, the iris had become adherent, and that the black mass was uveal pigment in the scar. There seems to be no history of injury, but in the case of small children this does not count, as frequently they do not come till several days after such an injury, as there is usually little pain and they are afraid of getting themselves or their friends into trouble.

Mr. LESLIE PATON (in reply): No skiagram has been taken, and I could not transilluminate owing to the lachrymose condition of the child. It is only a week since I first saw her. At first sight the obvious thing was to suppose that something had been driven through into it, because there is a darker centre to it. But there is no history of injury at all. It was first noticed seven weeks ago, and the child was not in pain, and has never had pain. The mother is certain that if the mass had been there before she would have noticed it. The iris fibres bulge sideways when the pupil is small. Of course the pupil has not yet quite recovered from the effect of the atropine, but I could see the iris fibres curled apart one from another, and that made me suspect there might be a growth in the ciliary region and that what we see might be a secondary pigmented outgrowth from the ciliary region. On the other hand, on looking at it very carefully, its position in the corneal tissues seems rather too superficial for that to be the case. I have not inspected it with a binocular microscope. It may be subepithelial in the cornea.[1]

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[1] *Note.*—January, 1917: I have since seen a case of an exactly similar nature—i.e., a brown pigmented plaque at the margin of the cornea, resulting from a needling for lamellar cataract performed about ten years ago. Despite the mother's absolute denial of any accident in the case shown, this, in my opinion, renders it most probable that also it is the result of a needle piercing the cornea.

(*November* 1, 1916.)

Case of Pigmented Degeneration of the Retina, associated with Epileptic Fits.

By F. E. BATTEN, M.D.

THIS is a case of Captain Ormond's, and was referred to me for an investigation of the nervous system. The patient is a man, aged 23, and he first noticed failure of eyesight in 1910. This steadily progressed, and has done so more rapidly during the past year. Epileptic fits began in 1913, and these have become more frequent during the past year. Captain Ormond found there was a central scotoma in both eyes, somewhat to the temporal side, and optic atrophy, with some pigmentary disturbance at and near the macula with diminution of vision to $\frac{6}{60}$.

Physical examination of the nervous system had a negative result. Both the blood and the cerebrospinal fluid have been examined, and give a negative Wassermann reaction. The father undoubtedly suffered from syphilis, but no evidence of the disease is present in the son.

The case is shown in order to elicit the opinions of members of this Section with regard to the pigmentary change which is present, as to which class of degeneration it belongs. The patient is the fourth member of the family, and no other member of the family is affected, so far as I know. His brother is a prisoner in Germany; his two sisters, who are older, I have not been able to see, but they are said to be normal.

DISCUSSION.

The PRESIDENT: I think the scotoma involved the fixation point in one field but not in the other. The scotomata did not appear to be quite symmetrical. The absence of a positive Wassermann test seems to be against it being due to congenital syphilis: it was negative both in the blood and the cerebrospinal fluid. I think this is the type of case which might profitably be brought up again after further observation, to see what happens to the disks. They struck me as still being congested.

Captain ORMOND: This patient was sent to me first of all because the sight was failing rapidly, and I elicited from his mother the fact that he had had a number of fits. The first fit was in October, 1913. He had another the following month. He had two in 1914, and five last year. Since then he has had seven fits. They are increasing in frequency. The disks are very hazy, and the vessels contracted. The pigmentary changes in the macula spread a good way towards the periphery. At first, owing to the marked history of syphilis in the family, I thought that we were dealing with a case of congenital syphilis. His teeth, however, showed no signs of that disease. Dr. Gordon Goodhart did a Wassermann reaction for me, which was negative. Thinking the patient might have some other cerebral condition, I sent him to Dr. Batten, who investigated the case very thoroughly. Mr. Paton has since taken his fields carefully, during his stay in Queen Square. The patient has also had some extraordinary sores on his legs, the nature of which I do not know. He had about half-a-dozen of them, and they were a long time healing. The sight is certainly failing now, and has been so for the last eighteen months. He can fix with both eyes, if the object is sufficiently large. The scotomata are not absolutely symmetrical.

Mr. RAYNER D. BATTEN: I think the macular type of degeneration, having developed, does not progress, but remains stationary. This case appears to be progressive, which points to it being a syphilitic type of central retinitis, rather than belonging to the macular type.

Mr. STEPHEN MAYOU: With regard to the stippled appearance in the retina, I think most of the cases show this, in addition to the macular changes. I have seen altogether four families with the disease: two have been shown here, and two are represented in patients I have at present under my care: they all show stippling at the periphery of the retina. In the two families of my own, which I have mentioned but not shown because I was not quite sure they belonged to this class, one could not say there was definite cerebral degeneration at all: all one could say was that they were rather curious people, of not quite normal mentality. Otherwise, the appearance in the fundus was exactly similar to that in this case. They were two sisters in one family, and father and son in another, and in none was the Wassermann test positive.

Mr. J. HERBERT PARSONS: There does not seem to be much evidence that this case belongs to the group named. I understood Dr. Batten to say that he found nothing wrong with the central nervous system; except for the history of epilepsy it seemed to be normal. It is well known that there are seldom changes in the fundus in epilepsy; and it is a question whether it is not a mere coincidence that this condition of eye should occur in a patient who has epilepsy. I should very much like to hear the opinion of the senior members of the Section as to the frequency of macular changes in congenital syphilis, similar to those in this case. My own experience is not sufficiently great for me to give an opinion. I should have thought it was not very rare to find changes in the macula similar to these. I agree with Dr. Batten that the cases which he has grouped together are cognate. As I have already said more than once, I think the amaurotic family idiocy cases should be kept abso-

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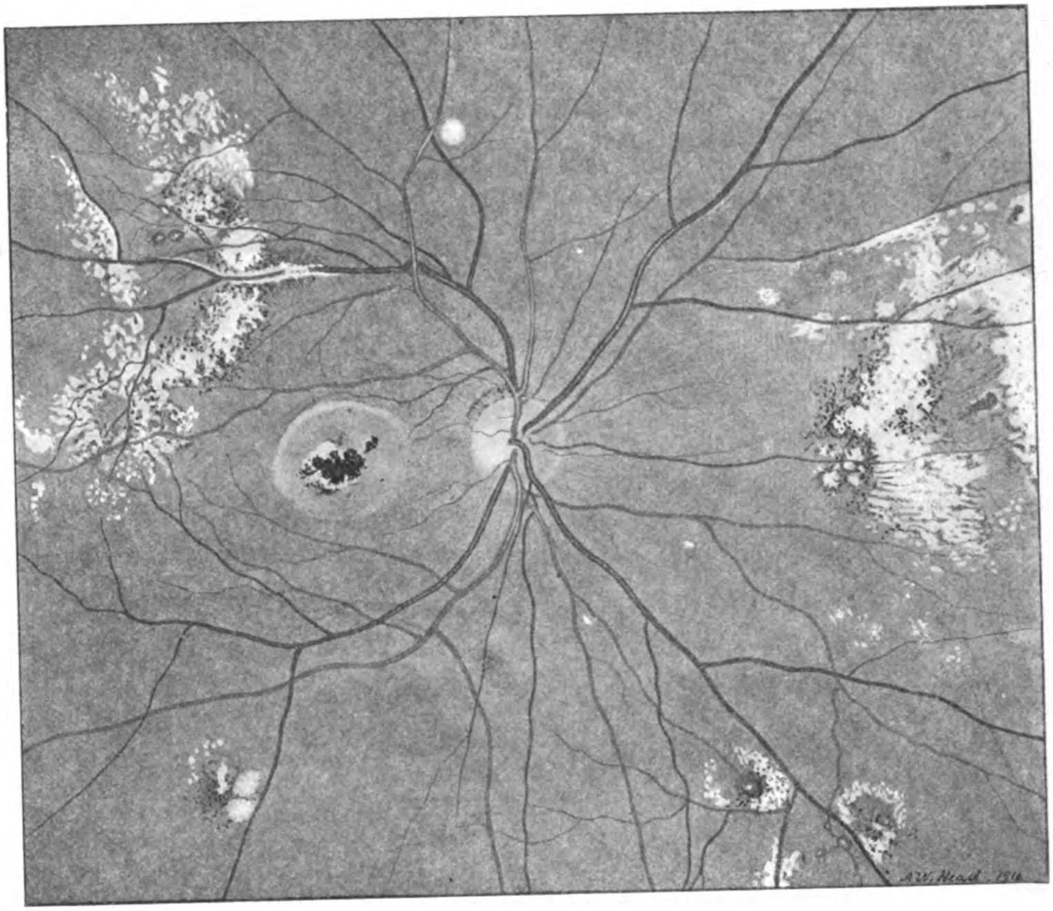


FLEMING:

Case of Retinal Arterial Disease, with Miliary Aneurysms and Exudates.

lutely distinct, for the other cases are only remotely related; and in this case the evidence of association seems to be particularly slight.

Mr. LESLIE PATON: Dr. Batten asked me to see this patient when he was admitted for observation at the hospital. Before I knew anything of the history, I was struck with the extreme resemblance to one of the cases shown by Dr. Batten which I saw two years ago, an instance of Batten maculo-cerebral degeneration. On further examination I found that there was an absolute central scotoma 10 mm. wide, extending for some distance out, in both eyes. We took his fields with the Bjerrum screen. There was another feature, namely, that he complained of night-blindness, which had been experienced some considerable time. I am surprised to find that there is no obvious limitation of the peripheral fields. The whole retina has an atrophic appearance: it has the "autumn-leaf" appearance of retinitis pigmentosa; there is certainly a generalized atrophy of the retina, and there are the very much reduced blood-vessels which we see in retinitis pigmentosa. When I learned the history, I thought it might be retinitis of syphilitic origin, with subsequent atrophy. But I think syphilitic retinitis, as distinct from choroido-retinitis, is rare in congenital syphilis. It is commoner in association with acquired syphilis. In view of the negative Wassermann tests, I feel myself driven to the view that this case is allied to the Batten type of cerebro-macular degeneration. I have already expressed my view that these cases should not be mixed up with the ordinary Tay-Sachs type of amaurotic family idiocy; but I know that Dr. Batten and I do not quite agree about that. There is little doubt about the failure of vision in this case in 1910. He was seen by somebody then, but it may have been simply a question of an error of refraction necessitating glasses.

(*November* 1, 1916.)

Case of Retinal Arterial Disease, with Miliary Aneurysms and Exudates.

By NORMAN B. B. FLEMING, Lieut. R.A.M.C., M.B., Ch.B.

C. came under my notice at the Central Recruiting Depot, and I found that he had a complete central scotoma in his right eye. The patient had been aware of this for some time, but had on no occasion sought any advice. His mother attributes the loss of vision to a blow on the eye in childhood, but medical attention was not required and the injury apparently was not serious; he complains of no other sign or symptom. The fundus presents widespread changes resembling those found in retinitis circinata, but not showing the characteristic distribution. There is a dense patch of pigment at the macula, surrounded by an area of light colour, this in turn having a definite limit which is nearly white and which at the upper part appears to be raised. There are very extensive opaque white patches in nearly all parts of the fundus, and the retinal vessels are in some cases embedded in this material. Several old hæmorrhages are present and a few recent hæmorrhages at the periphery. There is some local sclerosis and aneurysmal dilatation of the retinal arteries and thickening of the veins, particularly the superior temporal vein.

In a collection of cases of retinitis circinata Fuchs[1] reports that in one case only was alteration of a retinal artery found, and I have been unable to find any other case in which such change has been noted. The pigment at the macula and the irregularity and extensiveness of the opaque white exudate are of a nature quite different from that described in any of the articles I have consulted.

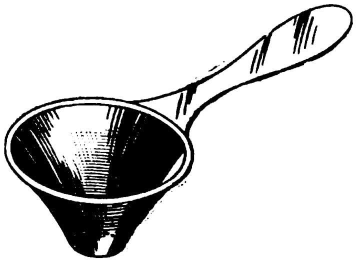
(*November* 1, 1916.)

Speculum for Use in the Operation of Evisceration of the Sclera, and in Enucleation of the Eyeball.

By A. C. HUDSON, M.D., F.R.C.S.

THE instrument I have exhibited is designed on the model of a modified trumpet-shaped ear speculum. It is intended for use in the operation of evisceration of the eyeball, and in some cases of enucleation.

In the former operation it affords a perfect view of the region of the optic nerve entrance, the pressure of the leading edge of the instrument



Speculum (two-thirds actual size.)

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[1] Fuchs, *Rev. Gen. d'Opthal.*, 1894, xii p. 76.

ensuring a bloodless field, so that all remnants of the choroid adherent around the nerve head can be removed with certainty.

In the case of accidental button-holing of the sclera in the course of enucleation the residual stump can be easily identified by means of the speculum, and any portion of the globe that remains adherent to the optic nerve can be readily demonstrated and removed.

I hope that the use of this instrument may serve to diminish the incidence of cases of imperfect removal of the choroid in modified excision of the eyeball, with its attendant risk of sympathetic inflammation, several of which cases I have myself recently met with.

(*November* 1, 1916.)

The Photography of Macroscopic Eye Specimens.

By Lieut.-Colonel and Mrs. R. H. ELLIOT.

THE advantage of being able to photograph one's own specimens of pathological eyes, whether macroscopic or microscopic, is too obvious to call for comment. Any worker who wishes to do this will find himself confronted with considerable difficulty in obtaining information as to details of technique, exposure, &c. In photography detail is everything. We have recently had occasion to photograph a number of both naked-eye and microscopic sections of eyes, and the object of this paper is to place some of the information so gained at the disposal of others. It is not proposed to waste space over a description of methods of sectioning eyes, &c. This has already been done elsewhere. We start, therefore, with the half-eye, or with the mounted section ready to hand.

METHOD OF PHOTOGRAPHING CUT EYES.

If a good photograph of a sectioned eye is to be obtained, attention to certain points is essential: (1) The eye must lie completely under water; (2) the source of light must be good and even; (3) the camera must be placed vertically above the object in order to avoid reflexes; (4) the object photographed must be so placed that its image will occupy the centre of the plate, and adjustment should be available to secure this end with a minimum of inconvenience; (5) a simple arrangement is necessary to fix the eye in position during the whole period of exposure; (6) to save unnecessary retouching, the object should be photographed lying upon a dark and even surface, so that the background should in no way disturb the attention of anyone looking at the picture; (7) a suitable camera should be selected; (8) the question of exposure must be very carefully studied. We will take these points seriatim.

(1) It is most important that *the object photographed should lie completely under water*, and as near the surface of the fluid as possible. If any part of the specimen projects, the water immediately around it is drawn up towards it in a slope presenting a meniscus. This causes the appearance of a very embarrassing light reflex, not only detracting from the scientific value of the representation, but also completely spoiling the picture from an artistic point of view. It might be suggested that the object should be photographed either in a specimen bottle, or in a cup covered by a slip of glass. Experience has led us definitely to discard any such method. The best results are obtained when the intervention of glass sheets is completely avoided. There is, however, one point to bear in mind—viz., that it is necessary to be careful to see that no specks of dust settle on the surface of the fluid, as these will appear enlarged in the negative, and enormously so in a lantern picture obtained from a slide made from it. The dust in the room must not be disturbed beforehand, and any specks which settle must be carefully removed just before the exposure is made. This can best be done by means of a pair of forceps, or some similar instrument. Cotton and other fabrics should not be used, as they deposit particles in return.

(2) *The Source of Light must be Good and Even.*—It is possible to work either by daylight or by artificial light. Each has its own advantages. If daylight be used, it is advisable to work opposite a high window with the light coming from above, as in this way reflexes are more easily avoided. Daylight is more readily obtained and costs nothing, while artificial light is more constant, and possibly admits of a greater command of the illumination. This is said to be an advantage when it is desired to select for reproduction certain deeply seated parts of the specimen, such as a scar just behind the ciliary body. The best form of artificial light is that obtained from an arc lamp. Care must be exercised to prevent the rays impinging directly on the lens of the camera, or fogging will result. Satisfactory arc lamps are rather expensive, and their employment involves the use of a resistance.

A knowledge of them is necessary, but they are easy enough to work with after a little practice. They possess three great advantages: (1) The time exposure for them is constant, whereas when working with daylight, very considerable allowance has to be made for the season of the year, and for the nature and time of day. (2) The exposure is considerably shorter. The most convenient method of working the lamp is to have it placed sliding on a vertical bar set in a heavy stand, and so arranged that it can be clamped at any desired height. (3) We are able to eliminate the inconvenience caused by the shadows which we get when working with daylight.

(3) *The Camera must be placed vertically above the Object.*—In order to do this, some form of apparatus is necessary. The firms that specialize in such work will supply a very elaborate stand for the purpose. We found, however, that a comparatively simple arrangement in metal satisfied all our requirements. It was made for us by Messrs. Spiller for a very reasonable sum. The necessary parts of it are: (*a*) an arrangement to clamp the camera and keep it rigidly in position; (*b*) a framework to connect this with the floor or table; and (*c*) a simple device to carry the specimen in its tray, and to admit of the latter being raised or lowered to a suitable focus. In order to avoid reflexes, the tray should be made of wood or metal painted dull black, and not of glass.

(4) *The Centring of the Image on the Plate.*—This is a most important step. It can be carried out by one or another of a variety of mechanical arrangements, but in our experience it is far safer to trust to the focusing screen.

(5) *An Arrangement to fix the Eye in Position.*—We may clear the ground by laying down what our experience has shown us are mistakes. First, *no* fabric should be used. We have tried paper, cloth and velvet, and have discarded them all, as they deposit fluff on the surface of the water, and so tend to damage the photograph. Next, receptacles made out of millinery wire, though very nice in some ways, are hard to hide from the camera, and are apt to be unsteady. We think that the best arrangement is that of a metal plate, painted dull black, and cut so as to fit into the sides of a photographic developing tray. In this plate should be cut three holes to accommodate large, medium and small eyes respectively. These must not be too close together, to prevent inclusion of an empty one on the plate. It is advisable to avoid shaking of the object by rough movements in the room during exposure, as its position may thereby easily be altered. Nothing should be done that is likely to stir up dust.

(6) Much after trouble is saved both for prints and for lantern slides by paying careful attention to the question of *background.* Nothing can be better than a metal plate evenly painted a dull black as above suggested.

(7) *The Selection of a Camera.*—Practically speaking there would appear to be three methods open to the photographer. He may use a telephoto lens, a double extension camera, or an ordinary camera with the addition of a lens on the planiscope principle. Our own work has been done with a Goerz five-magnifying power telephoto lens, with ring attachment. We need hardly say that we bought it before the War. Ross now makes a similar instrument. The great advantage of a telephoto lens is that a picture can be obtained double the size of the object. The disadvantages are: (1) the cost of such lenses, and (2) the increase in the length of the exposure necessary. There is a prevalent idea that expensive lenses enable one to obtain better pictures. This is a delusion. The advantage of an expensive lens in ordinary photography is that it enables the operator to obtain a perfect picture with a very short exposure. This is due to the fact that the better lenses will give sharp and even focus with wide open stops, which the cheap lenses cannot do. If the exposure is to be a long one, a cheap lens will do as good work, within certain limits, as a very expensive one. If a double extension arrangement is used, or if an attachment, on the planiscope principle, is employed, the picture can be made life size. It can be subsequently enlarged if desired. The latter procedure is not quite so simple as it sounds, and in photography as in eye-surgery, the multiplication of operations is fraught with danger. The added expense of an enlarging lantern has also to be considered. There can be no question that a study of pathological changes in the eye picture is greatly facilitated by its magnification to two diameters. A small point which should be mentioned on the other side, is, that the distance at which the double extension, or the planiscope fitted camera is worked, is much less than that required when using a telephoto lens. This makes the stand required less clumsy, and the working proportionately easier.

(8) *The Question of Exposure.*—This is far and away the most important point we have to consider, but no hard and fast lines can be laid down, since so much will depend on the source and nature of the light, on the brand of plate, and on the stop used. There are, however, certain points which require consideration. The fact that the photographs are taken under water is of very great importance, for the exposure needed is much greater than that for dry objects, indeed it is

ten times as much. We have also formed the opinion that the shallower the layer of supernatant water, the less the light is interfered with photo-chemically. On this subject we do not venture to dogmatize, as we have not worked it out. Another point to be borne in mind is that the majority of sectioned eyes are very dark objects, owing to the presence of the uveal pigment. This lengthens the exposure and also makes it extremely difficult to bring out the appearance of parts which lie in the shadows caused by the source of illumination. Yet another point is, that inasmuch as we are photographing hollow objects, the details of which do not lie in one plane, we must necessarily use comparatively small stops (F16, or thereabouts, with an ordinary lens); this again adds to the length of exposure. Our experience with the telephoto lens in winter time, under not very brilliant conditions of lighting, and using F11 and rapid plates, was that an exposure of from twenty minutes to half an hour was necessary. With a double extension camera, or with a planiscope, the period would be greatly lessened, and probably would be nearer two minutes. Each worker must find out these details for the conditions under which he works, but we think it is as well for him to err on the side of long exposures at first.

Closely allied to this question is that of the plates to be selected. We worked with Imperial Non-filter plates, but those working with cameras which require a less exposure might find it an advantage to use slower plates.

MAGIC LANTERN SLIDE-MAKING.

There are two methods of making magic lantern slides—(1) by contact, and (2) by the use of a camera. The former method is by far the simplest, as all that it is necessary to do is to place the plate in contact with the negative in a printing frame and to expose it to a chosen source of light for a definite time. The limitation of this method is that the magnification of the lantern slide is exactly the same as that of the original negative, whereas if a camera be used it is possible to reduce the image in such a way that the details of a large plate can be produced within the limits of a slide, or, if desired, we can magnify any portion of the field of the plate on to the lantern slide. It must be remembered that such processes are attended by complications which may spoil or damage the slide, whereas with the contact method we have reduced the procedure to its simplest elements. It is, in fact, no more difficult than gas-light printing. Those who desire to study a simple text-book on the subject are recommended to read "Lantern-slide Making," by the Rev. F. C. Lambert, M.A., published by Hazell, Watson and Viney, Ltd. For the purpose we have in hand the contact-method satisfies all requirements.

(1) *Exposure.*—The photographer must select the source of light that he is going to use and work with that one throughout. Our experience has been with electric light, but it is possible to use oil lamps, gas, or magnesium wire. For the guidance of those who prefer to follow our example, it may be of interest to note that working with a six candle-power frosted lamp the exposure for an ordinary negative at 2 ft. was one of ten seconds when using the Ilford Special Lantern plate.

(2) *Preparing the Plate for Exposure.*—It is necessary to dust the negative carefully with a camel's hair brush, as otherwise particles of dust will cause what are spoken of as pin-holes in the slide. It is not, however, advisable to dust the magic lantern plate itself, for by so doing we develop frictional electricity, and so cause the attraction of dust particles. It is better to be content to give the edge of the plate a sharp rap on the table in order to shake off dust particles. In doing so we must be careful not to break the glass, as we have lately found some of the glasses to be very thin, possibly a result of "war economy."

The film side in lantern plates is not very easy to recognize, as the coating is thinner than that of ordinary negatives. If in doubt as to which is the film side, damp your finger slightly and try it on one corner of the plate, when the film will reveal itself by its stickiness.

We have found it of great advantage to take out four plates at a time, and to store those not actually in use in the black envelopes which can be purchased for the purpose at any photographic store. This avoids the trouble of opening, unpacking, and repacking the plates, first in their folds of paper and then in their original box.

(3) *Development of Lantern Slides.*—We have used hydroquinone as a developer, and have had every reason to be satisfied with it. It is an advantage to filter the solutions (both developing and fixing) in order to eliminate the presence of solid particles which might cause pin-pricks. One quantity of solution should not be used for more than four plates. The use of clean fixing solution for each batch of plates is imperative.

(4) *When to stop Development.*—There is no such thing as a perfect lantern slide. A density which is suitable for one light is quite unsuitable for another; the stronger the light the denser should the slide be made. When a strong slide is needed it is necessary to continue development until the high lights have begun to brown over as seen by reflected illumination.

(5) *When to stop Fixation.*—The danger lies in too short a time being allowed for this purpose, since the film, being thinner than that of ordinary negatives, clears with unusual rapidity. No harm will come from over-fixing if the bath be clean. A quarter of an hour may safely be allowed for the purpose.

(6) *Drying of Plates.*—It is important to dry the plates in a dust-free place, since every speck of dust is greatly magnified by the lantern. Not only that, but before the plate is placed in the drying rack it should be carefully wiped over with cotton-wool under water in order to remove any sediment without scratching the plate, and the glass side should be wiped dry with a cloth. Some people advocate drying under methylated spirit, but our experience in this respect has not been very fortunate. We prefer, if possible, to avoid unnecessary manipulation.

(7) *Reduction and Intensification of Lantern Slides.*—These processes should be carried out on the same lines as for ordinary negatives. The matter is dealt with at length in Lambert's book already recommended. It is a very distinct advantage to intensify or reduce certain negatives.

(8) *Varnishing of Lantern Slides* is not necessary, and entails the possibility of serious disadvantages arising unless the manipulation is very skilfully performed. The method of binding, masking, spotting and otherwise marking lantern slides is explained in Lambert's book.

(*November* 1, 1916.)

Bilateral Glioma of the Retina with Multiple Metastases.

By FRANK E. TAYLOR, M.D., F.R.C.S., and NORMAN B. B. FLEMING, M.B., Ch.B., Lieut. R.A.M.C.

A CRITICAL examination of the collected statistics of Wintersteiner [7] on glioma of the retina reveals the fact that when malignant characters are borne by this neoplasm they are shown by the extension and spread of the new growth in two ways, namely:—

(1) By involvement of the extra-orbital structures of the face and head, either (*a*) by direct continuity of growth into the bones and other structures adjacent to the orbital cavity; or (*b*) by direct extension of the growth backward into and along the optic nerve to the meninges

and the brain; or (*c*) by the occurrence of growths in the lymphatic glands in the neighbourhood of the parotid gland, and also occasionally involving that organ.

(2) By the formation of metastatic growths in various organs in distant parts of the body.

That the former condition is much more frequently observed than the latter is also shown by Wintersteiner's figures. Out of a total of 497 cases of glioma of the retina, regional invasion occurred in the bones of the cranium and face in forty cases, in the brain and meninges in forty-three cases, in the adjacent lymph glands in forty-six cases, in the parotid gland in nine cases, in the spinal cord and membranes in three cases; whereas metastases in distant organs were found in the skeletal bones in nine cases, in the liver in seven cases, in the ovary in two cases, in the kidney in two cases, in the lungs in one case, in the spleen in one case.

Further, in addition to our own case here recorded, in which metastases occurred in the brain and meninges, in the vertebræ, in the mesenteric glands, and in the ovary, we are able to find only five cases recorded since those collected by Wintersteiner in which metastases in distant organs were found.

In Fehr's [2] case the metastatic growths occurred in the ribs, sternum, and pleura, in the inguinal and mediastinal lymph glands, and nodules were also found between the left lung and pericardium, and adherent in the anterior mediastinum.

In Radcliffe and Goldberg's [6] case metastases were found in the liver, and in Lieber's [4] case in the lungs.

Dahs's [1] case is buried in the obscurity of a Greifswald *thesis* to which we are unable to gain access: we are therefore unable to state the distribution of the metastatic growths.

In Gardner's [3] case the organs affected were the sternum, ribs, costo-chondral cartilages, vertebræ, the pelvic bones, both femora, and both testicles.

With regard to the frequency of bilateral growths, the collected statistics of Owen [5] show the condition to be bilateral in rather less than 25 per cent. of the cases, for out of a total of 552 cases 417 were unilateral and 135 were bilateral.

Four facts connected with the following case are of sufficient interest to make it worthy of being placed on record, namely:—

(1) The presence of advanced growths in both eyes at the same time.

(2) The very advanced condition of the growths when the patient was first brought up for treatment.

(3) The presence of metastatic growths, both by direct extension into the brain and meninges, and by metastases in the vertebræ, mesenteric glands and ovary.

(4) The relatively small amount of shock and other disturbance which followed so severe an operation as complete evacuation of both orbits in so young a patient.

The history of our case is as follows:—

L. D., aged 3, was sent to the Royal Westminster Ophthalmic Hospital on February 14, 1916, and was seen by Mr. Elmore Brewerton, who ordered her immediate admission into hospital. Something abnormal in the left eye was first noticed eighteen months previously, probably in September, 1914. No advice was sought till September, 1915, when she was taken to the hospital at Guildford. The mother states that she was then refused treatment, on the ground that it was useless. The child had not been fretful, was fairly well nourished, and ate and slept well.

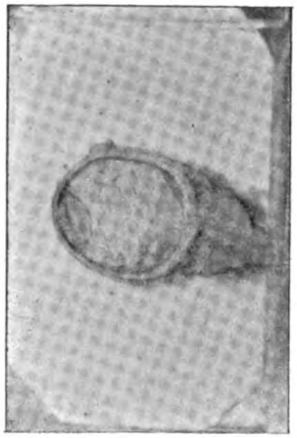

FIG. 1.

Hemisection of right eye.

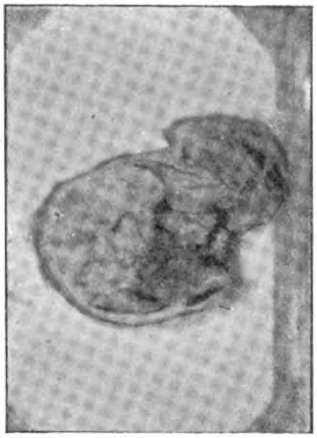

FIG. 2.

Hemisection of left eye.

On admission, a fungating growth protruded between the lids of the left eye, keeping them separate; it had been fungating for three months; the mass was moist with a thin semi-purulent discharge. The right eye was much enlarged and apparently proptosed. The iris was fully dilated and stretched into a thin band at the limbus. The lens was in contact with the posterior aspect of the cornea, being pushed forward by a growth behind. This growth was of a lemon-yellow colour, as seen by ordinary daylight, and also by oblique focal illumination. On ophthalmoscopic examination no reflex was obtained.

As regards treatment, an operation was performed within an hour of admission. The left orbit was exenterated. The lids were partly removed and the wound stitched up, an aperture being left for packing. The right eye was excised. The conjunctiva was removed and the optic nerve was divided ¾ in. behind the globe. The nerve was found to be involved, being surrounded by growth for ½ in. behind the eye. The right socket healed readily. The left socket became septic, and the discharge had an unpleasant odour, but rapidly improved when irrigated with hydrogen peroxide and dressed with iodoform.

On March 11 the child was discharged, there being as yet no sign of recurrence in either socket. While she was in hospital there was some bronchitis, from which she recovered, and at all times she took food with avidity.

The patient was re-admitted on March 30 with a large recurrence, equal in size to half a tennis ball, protruding from the right orbit. The left orbit was completely covered with skin, but, with a little pressure, a solid mass could be felt in the socket. The same day the right orbit was thoroughly cleared out, the greater part of the lids being removed at the same time. By this time the child was thinner, and was inclined to be fretful. She took the anæsthetic very badly and stopped breathing, but artificial respiration was successfully carried out. A general anæsthetic was required subsequently for the first two dressings, and the same difficulty with respiration was experienced. After this the child's condition improved, but a muco-purulent nasal catarrh developed, which persisted until death supervened about eight weeks later. The discharge was incessant, and before the end caused much excoriation of the face. The head was noticed to be disproportionately large, and emaciation was very pronounced.

The right socket quickly filled up again and the growth in the left one infiltrated the skin and became fungating, and both orbits were again cleared out on May 1. The greater part of the growths was found to consist of a material which had undergone pseudo-myxomatous degeneration.

After the final operation, the child quickly went downhill. She became quite apathetic, and neither ate nor slept. On May 3 she was found to have pneumonia of the left lung, but there were no rigors and no rise in temperature or pulse. She cried a good deal, and her breathing was short and jerky, but there was little to indicate that she was suffering much pain. On May 6 the right lung showed signs of consolidation at the base, and death occurred on the evening of May 7.

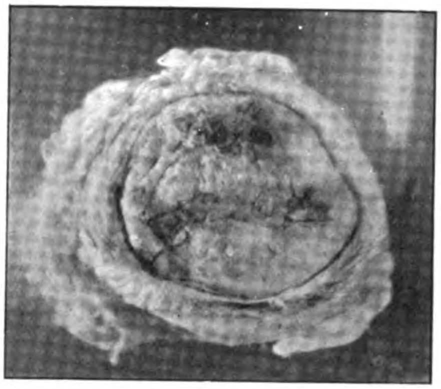

FIG. 3.

Recurrence from right socket.

PATHOLOGICAL REPORT.

The tissues removed from the orbits presented the following characters: Externally the right eye appeared normal except for a mass of new growth on the posterior aspect of the globe, embedded in which was the excised portion of the optic nerve. This mass was triangular in shape, being ½ in. wide and ½ in. from before backwards. On section, the coats of the eye appeared normal, but the anterior chamber was very shallow, the lens being pushed forward by a greyish-white growth which completely filled the vitreous chamber.

The left eye was enlarged and filled by a soft mass of new growth, which was everywhere confined within the coats of the eye, except in front where the lens and structures in front of it were missing, and the growth projected forwards between the lids, the surface being ulcerated and excavated. The posterior half of the neoplasm was of greyish-white colour, whilst the anterior half was of a dark brownish-red colour, as if infiltrated with blood. The structures of the eye, except the sclera, were entirely unrecognizable.

Microscopically, the growths were composed of closely packed small round cells, with large deeply staining nuclei, and extremely little surrounding cytoplasm. A few spindle cells were also present. Small syncytial masses, with multiple nuclei forming the so-called giant-cells, were scattered irregularly throughout the mass in small numbers. The intercellular stroma was extremely small in amount, and was almost unrecognizable. There was much hæmorrhagic extravasation into the growth, although blood-vessels were scanty in numbers. Neuro-epithelial rosettes were not to be found in the sections.

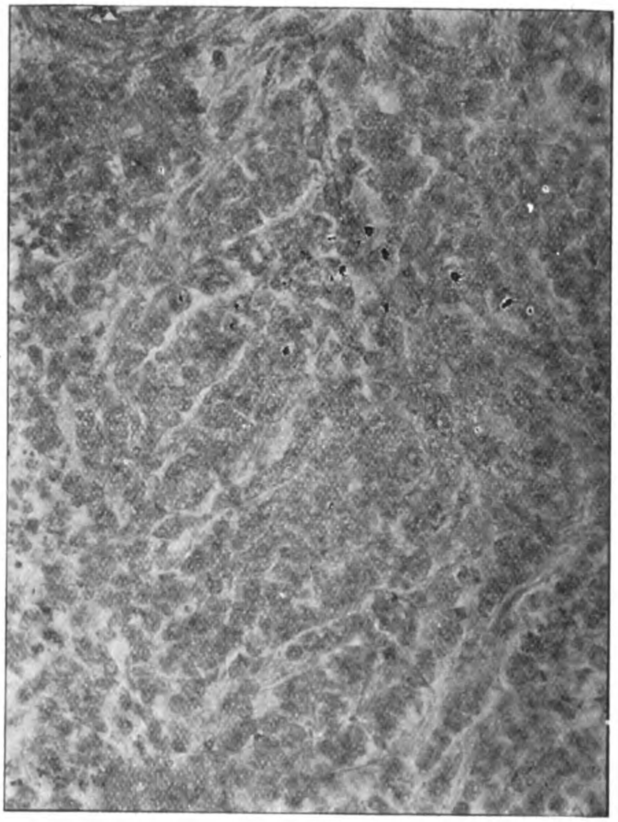

FIG. 4.

Section of glioma of eye showing masses of more or less degenerated round cells (feebly staining). (× 320.)

The choroid and optic nerve in both eyes were infiltrated with growth, so also was the left upper eyelid. In the right eye the structures anterior to the posteror capsule of the lens were quite free from growth.

POST-MORTEM EXAMINATION REPORT.

The body was that of an exceedingly emaciated female child, showing an extensive impetiginous rash on the face; both orbits, having been recently exenterated, showed gaping hollows revealing the base of the sphenoid.

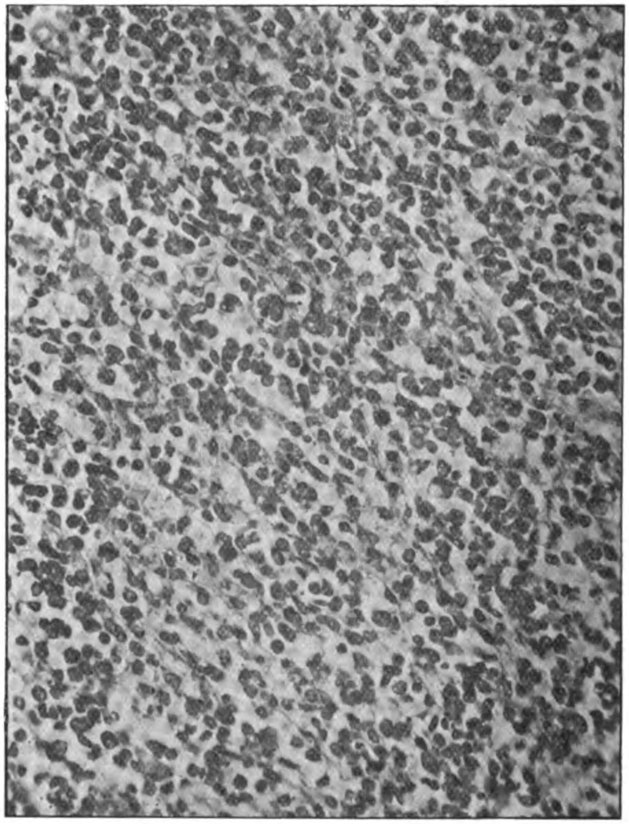

FIG. 5.

Section of secondary tumour of ovary, showing structure of round-celled sarcoma. (× 320.)

Removal of the calvarium was difficult, owing to the bone being adherent to the dura mater. This was found to be due to about twenty curious looking growths, round in outline, some of them being discrete and some coalescing. They were about $\frac{1}{4}$ in. in thickness, bright red in colour, like healthy granulations, and they varied in size from $\frac{1}{4}$ in. to

2 in. in diameter. The pia mater was hyperæmic in those areas, but apart from this the convexity showed nothing abnormal. The brain weighed 2 lb. 8 oz. At the base of the brain, in the position of the optic chiasma, and to some extent obscuring or replacing it, there was a large mass of growth covered by pia mater.

Both lungs showed a condition of septic pneumonia. The mesenteric glands were enlarged and were the seat of metastases. In the centre of the right ovary there was a blood-clot, measuring $\frac{5}{16}$ in. in diameter. This was surrounded by an area of new tissue, forming a zone $\frac{3}{16}$ in. in thickness. The right Fallopian tube was normal, so also were the left ovary and tube and the uterus and vagina. An oval mass of growth $\frac{3}{4}$ in. by $\frac{1}{2}$ in. protruded from the anterior aspect of the body of the second lumbar vertebra, and projected about $\frac{3}{8}$ in. above the surface of the bone.

The secondary growths in the meninges and in the ovary were examined microscopically and presented the characters of a small round-celled sarcoma, no neuroglial elements being recognizable.

Our thanks are due to Mr. Elmore Brewerton for his kind permission to publish this case.

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(*November* 1, 1916.)

Case of Recurrent Glioma of the Retina.

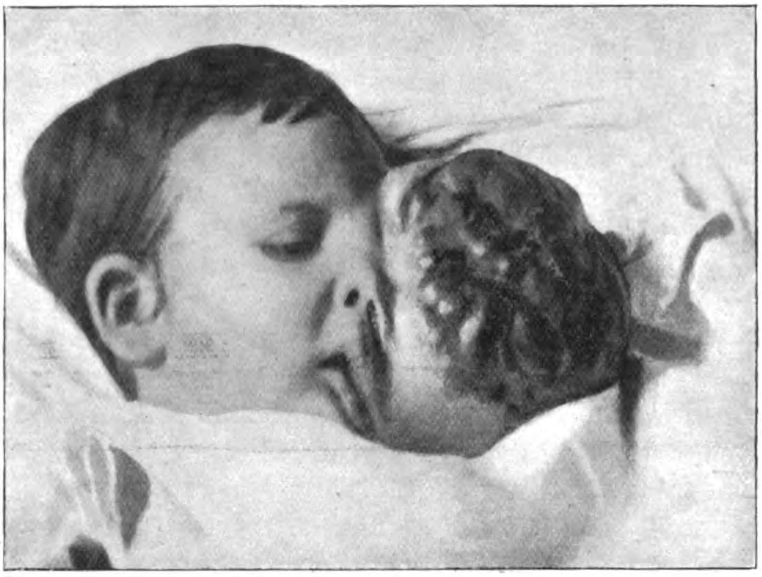
By ARNOLD LAWSON, F.R.C.S.

THE salient points of this case are as follows: The left eye was removed at Moorfields Hospital for glioma, the child, a boy, being then aged 3½. The condition of the eye after removal is described as follows by Mr. Greeves, who at that time was pathologist to Moorfields Hospital: "I find that there was a large scleral staphyloma in front, and that the thinned sclera was infiltrated with glioma cells—also that masses of growth could be traced along the sheaths of the vortex veins. The cut end of the nerve was apparently free of growth, although the proximal part (towards the eye) was infiltrated."

The boy remained well for a few months, when a recurrence of the growth in the orbital cellular tissue was noted. An exenteration of the orbital contents was then performed, but a few weeks later a fresh recurrence was noted and the child was sent to the Middlesex Hospital for treatment by radium. A large dose of radium was inserted into the growth and left there for four hours and a half. Free sloughing followed and on this account the child remained under in-patient treatment for about six weeks. At the end of this time all semblance of growth had disappeared and he was in excellent health.

Three months later he was re-admitted to hospital with a soft fluctuating swelling in the orbit, which was opened, and a considerable quantity of pus and pultaceous material evacuated. The condition was relieved for a time, but as the purulent discharge continued, an examination of the pus was made and *Staphylococcus aureus* was found in abundance. A vaccine was prepared and used but had no satisfactory effect. Further operative measures were tried about a fortnight later, and an attempt to clear out the cavity with the idea of using radium again. The swelling had increased a good deal by this time and very free hæmorrhage attended the operation and it was also found that the orbital bones were much eroded and that the antrum was open and full of grumous growth. Very severe recurrent hæmorrhage followed and lasted for two or three days, and further examination of the discharge led to the discovery of a streptococcus.

From this date the local condition went rapidly from bad to worse and the mass grew with extraordinary rapidity. The tumour spread over the parotid region, down into the neck, forwards through the skin, and inwards and backwards into the mouth. In spite of all, the child's general condition of health remained excellent till about three weeks before death, when rapid emaciation set in. Up to that time he was lively and cheerful and always ready to play with toys, and laughing and singing like any other happy child. Death occurred about three months after admission into hospital with the second recurrence.



Case of recurrent glioma retinæ. Photograph taken a fortnight before death. The superficies of the tumour is largely gangrenous.

The accompanying photograph, which was taken a fortnight before death, gives a good idea of the extraordinary rapidity of the growth and its enormous size. It is to be remembered that the period between admission into hospital and death was only three months, and that at the time of admission the growth was no bigger than a tangerine orange and then consisted chiefly of pent-up pus. The measurements of the growth, taken after death, were as follows: Circumference, 16¾ in.; vertical diameter, 12½ in. The weight was 43 oz.

The following précis of the post-mortem notes made by Dr. Cockayne are of interest: "The bones of the face were eroded and the growth had pushed its way into the mouth, displacing the jaws with their teeth. Inside the skull the tumour had penetrated through the sphenoidal fissure, and there was a large subdural mass which had flattened the under surface of the temporal lobe and had pushed back the anterior portion of the temporo-sphenoidal lobe. The olfactory lobe on the same side was flattened. Both optic nerves were quite free of growth so far as could be seen, and this was subsequently confirmed by microscopical examination. (The slide showing sections cut from both nerves is on view.) The growth had crossed the middle line under the dura mater in front of the optic nerves and chiasma—i.e., it extensively invaded the anterior fossa of the skull on both sides. The brain showed no abnormality whatever beyond displacement. All the organs of the body were perfectly healthy and there was no glandular involvement anywhere."

Microscopically the tumour in section (of which a slide is shown) is extremely cellular, with extremely slight supporting connective tissue. The cells are small and round or oval in shape, with large nuclei, and practically no protoplasm.

The outstanding features of the cases are, I think, the following :—

(1) The failure of radium treatment.

(2) The purely local nature of the recurrence, which was practically a continuation of the original growth outside the globe.

(3) The extremely rapid growth of the tumour when once it had been opened up, and after attempts had been made to clear it away.

(4) The total absence of true metastases and the complete freedom from involvement of structures such as the cerebrum, which, though covered by the meninges, were otherwise in immediate contact with the growth.

(5) The excellent general condition of the patient, whose health was not materially affected until the protrusion of the growth into the mouth set up acute septic absorption from which the child died.

The most interesting point is the question of metastases. Of course it is now well recognized that retinal gliomata or glio-sarcomata, as I think they should be called, are not very prone to give rise to metastatic deposits, except purely local recurrences in the immediate neighbourhood; but certainly such do occur sometimes, and it is strange that this extremely malignant growth exhibited absolutely nothing of the sort, not even implicating the stump of the optic nerve, which was lying all the time embedded in it.

The failure of radium treatment was unfortunate, because it appeared to be an excellent case for its use, and it really seemed at first as if it had effected a cure.

That the patient died directly from septicæmia there can be no doubt, and, as I have pointed out already, a most striking feature was the indifference of the child to this horrible growth, to which, until the mouth was invaded, it paid no attention except when dressing-time came round.

The growth itself caused the child no pain at all, and I never had to give any morphia or other anodyne. The worst part of the case towards the end was that the growth became gangrenous in places and the fœtor was intense. A free use of H_2O_2, and frequently applied wet dressings soaked in weak Sanitas solution, answered the best of the many things tried with a view to mitigating the fœtor.

DISCUSSION.

Mr. WM. C. ROCKLIFFE (Hull): Mr. Arnold Lawson's, Dr. Taylor's and Mr. Fleming's papers remind me of three similar cases of recurrent glioma occurring in my own practice. In the first case, the patient, aged 3, was brought back six weeks after the excision with a rapidly increasing recurrent growth in the orbit about the size of a walnut, which had been noticed about fourteen days previously. Six days later the growth had more than doubled its size, and an exenteration was done, the child dying shortly afterwards with glioma of the brain. Owing to the child taking the anæsthetic badly the primary excision was hurried and the nerve was divided closer to the eyeball than was desirable. Mr. Parsons reported: "The recurrent growth is not metastatic, but has invaded the whole length of the nerve by direct continuity, and has entirely replaced the nerve fibres. It also invades the other orbital tissues widely, and throughout has the typical appearance of a glioma of the retina." In the second case, a child aged 3½, the primary gliomatous growth extended deeply into the orbit and the excision was complicated by very free hæmorrhage, and again the nerve was divided nearer the globe than was intended. The patient was re-admitted, twenty-four days later, with a large recurrent growth in the orbit protruding ¾ in. in front of the superciliary margin. Exenteration was done at once and the late Mr. Coats reported "typical glioma." A week later a *second recurrent* growth commenced rapidly filling the orbit, and as the child showed cerebral symptoms the patient was removed by its parents. Four days afterwards *extraocular metastases* developed over the occipital bone and steadily increased in size, and the child died about two months after the primary excision, extremely emaciated with secondry growths on the skull and lower jaw. This case, even to actual dates, is almost identical with Mr. Fleming's, and, like his and my first case, succumbed in two months after date of excision. In the third case, a child aged 3, the recurrent growth did not appear until six months after excision of the left eye. It was accompanied by cerebral symptoms. A month later the child was in a comatose condition, with twitching of the right arm and face, and apparently right hemiplegia; there was also considerable ecchymosis of the right orbit. The child died in convulsions six weeks later—i.e., nine months after the excision. Mr. Treacher Collins reported it as a case of "typical glioma."

Mr. E. TREACHER COLLINS: With reference to that last remark made by Mr. Rockliffe, I should like to say that I do not regard glioma of the retina as a sarcoma. It is best spoken of as neuro-epithelioma. It is interesting to contrast the way in which different forms of malignant intra-ocular growths spread, that is to say, glioma as compared with sarcoma, the one beginning in the neural epiblast, and the other originating in mesoblastic tissue. Sarcoma of the choroid generally spreads by metastasis: the large majority of the patients who die from sarcoma of the choroid die from metastatic growths. But the gliomatous growths, as we have heard to-night, and as I found in a series of cases traced out in association with Mr. Lawford, usually spread by continuity. Recurrences when they occur are usually local, in the orbit, about the face, or in the brain. In trying to find an explanation of the difference in the way in which these growths spread, we may, I think, look to the work of Mr. Sampson Handley, who showed that cancer of the breast usually spreads by "centrifugal lymphatic permeation." This is probably also the case in glioma of the retina, while sarcoma of the choroid is spread by emboli of sarcoma cells carried in the blood stream. As a clinical point, I would like to ask members of the Section whether they have ever checked the spread of a gliomatous growth by doing an exenteration of the orbit. I have done exenteration many times, but have never, in these cases, saved the patient's life.

Mr. HOLMES SPICER: In 1901 I had a case of glioma of both orbits in a child. Mr. Brewerton helped me to remove the left eye, the other had been previously removed for glioma: a long piece of the nerve was taken; the eye was full of glioma, but the cut end, examined by Mr. Brewerton, was healthy. Two months later there was a recurrence in the left orbit about as big as a filbert; the orbit was evacuated; the removed part was examined by Mr. Brewerton, and was reported on as gliomatous, but unfortunately the note of the detailed examination cannot be found. The patient is alive now after fifteen years.

Mr. ELMORE BREWERTON: I may say I exenterated the orbits of this child four or five times, but I did not do so with the idea that I was thereby saving the patient's life, but rather to save some of the trouble to the nurses at the hospital in looking after the patient. The cleared-out orbit was far easier to dress than was a fungating mass, which, as Mr. Lawson has already said, smells horribly, although it is not painful to the patient; and I am sure the patient is more comfortable after exenteration. If the growth is limited to the orbit I think exenteration should always be done. With regard to the case mentioned by Mr. Holmes Spicer, the eye condition was not quite a typical glioma; it was at a late stage, and showed no rosettes. The nodule which was subsequently removed from the apex of the orbit showed the usual round cells of recurrent glioma.

Mr. J. H. PARSONS: I should like to protest against the inclusion of glioma among the sarcomata.

Lieut.-Colonel ELLIOT: I agree with Mr. Brewerton in what he has said. In India I saw many of these cases, in the condition of masses fungating from the orbit. When the growths were confined to the orbit, there was no question that an enormous difference was made to the patients' comfort—especially if they could not be kept indefinitely in hospital—by the performance of exenteration. Sometimes I had to do it more than once, but do not remember a single case of such a patient dying on the table or in hospital after operation. Although I knew I was fighting a losing battle, the object was to confer increased comfort on the sufferers.

Section of Ophthalmology.

President—Mr. WILLIAM LANG, F.R.C.S.

(*February* 7, 1917.)

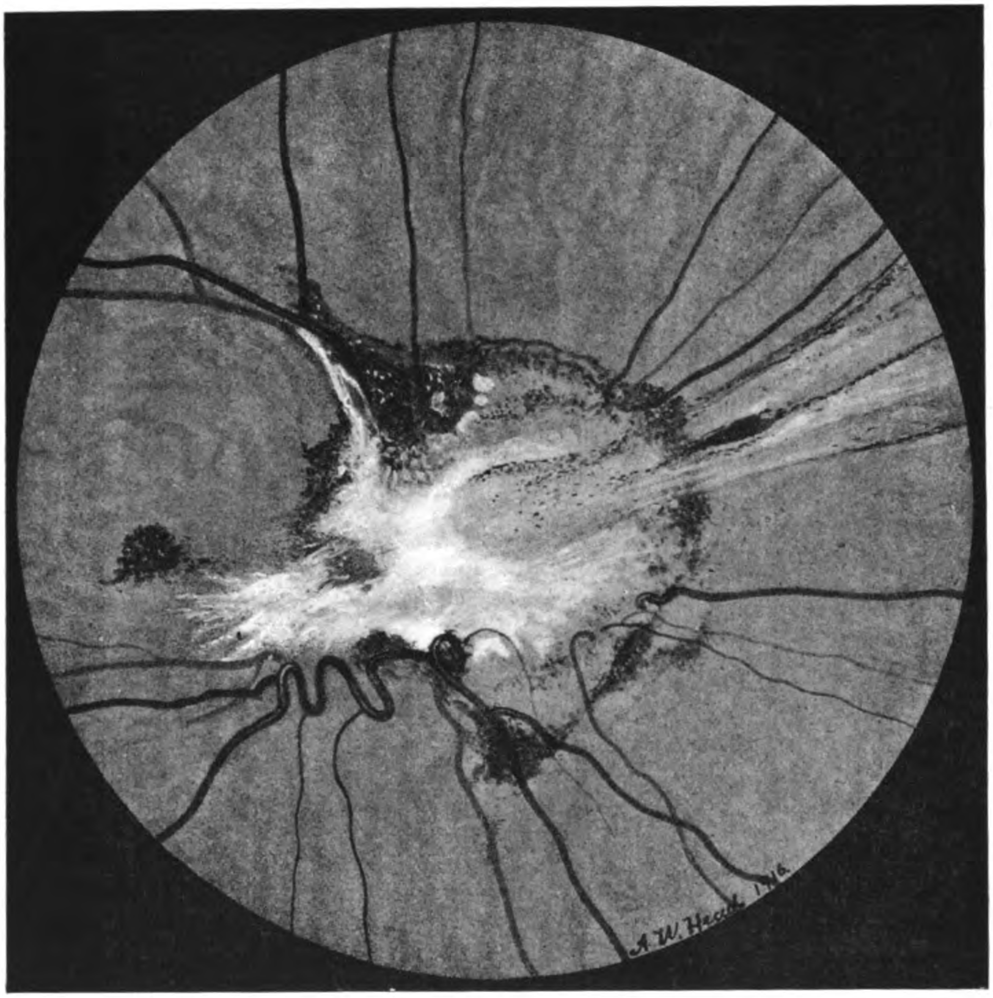
Rupture of the Optic Nerve (?).

By GUSTAVUS HARTRIDGE, F.R.C.S.

LIEUTENANT D., of the Royal Flying Corps. In August, 1916, he was flying in France and when about 3,000 ft. up, he suddenly fainted and remembers nothing more until five days later when he regained consciousness and found himself in hospital. An observer who saw the accident said that the machine came down gradually at first, but the last 500 yds. it fell vertically and was smashed to pieces. The patient sustained serious damage to the left arm and the right eye, as well as many small injuries; no apparent skull injury.

When I saw the patient on September 22, three weeks after the accident, there were extensive subconjunctival hæmorrhages in both eyes. Right eye: Pupil widely dilated and inactive to light; the vitreous was full of blood and no details of the fundus could be seen; there was a small punctured wound through the upper lid, immediately below the supra-orbital notch; a probe passed into the puncture only went a small distance into the orbit and no foreign body could be felt. The vitreous hæmorrhage gradually became absorbed, and the present condition of the fundus is well shown by the drawing (*see* next page). Left eye: Vision $\frac{6}{5}$, fundus normal.

The PRESIDENT: I remember seeing a boy who had been poked in the eye by a clothes-prop, and the lower portion of the optic nerve was torn away from the margin of the disk. At first, one could not distinguish anything except a large hæmorrhage and a deep excavation. The case is recorded in the *Transactions* of the Ophthalmological Society.[1] Subsequently there was only a half-field, the absent upper half corresponding to the torn lower half of the disk. It appeared, ophthalmoscopically, very similar to what one sees in coloboma of the optic nerve sheath.



Rupture of the optic nerve (?).

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[1] *Trans. Ophth. Soc. U. K.*, 1901, **xxi**, p. 98.

(*February* 7, 1917.)

Unusual Condition of Choroid (? Congenital).

By HAROLD GRIMSDALE, F.R.C.S.

M. B., FEMALE, aged 23, attended St. George's Hospital as a medical out-patient. The condition was diagnosed as hypothyroidism and she was looked upon as a sporadic cretin. As her vision was obviously defective, she was referred to the ophthalmic department, when the appearances were noted. In both eyes there is an area of choroid tissue, of rather darker colour than normal, surrounding and including the disk and macula; the shape is subovate with the long diameter, which is roughly twice the vertical, transverse. The remainder of the fundus shows the white colour of the sclera, crossed by the retinal vessels and a few large choroidal trunks. There are a number of patches of pigment, not heaped-up but flat, scattered over the whole. Her vision is $\bar{c}$ – 5 sph. – 3 cyl., $\frac{6}{60}$ in each eye, and binocularly $\frac{6}{36}$ doubtfully. She is stupid, and the field could not be mapped out but it is clearly much contracted. A Wassermann reaction has not yet been obtained.

I take it this is a congenital absence of choroid, but it differs from the only other case of the kind I have seen, partly because the area of choroid left is much more irregular in shape, but more so because of the pigment in the rest of the fundus. I have never seen anything like these large irregular masses of pigment, not heaped up, but apparently lying flat over the vessels, and scattered over the greater part of the white sclerotic.

(*February* 7, 1917.)

Three Cases of Fur Infection of the Conjunctiva from Cats.

By ARNOLD LAWSON, F.R.C.S.

ALL three cases occurred in children whose parents were of the prosperous classes, and whose homes were therefore of the cleanest and best. I have never personally come across a similar case occurring in an adult.

CASE I.

My notes on this case, which occurred some years ago, are not satisfactory as I have somehow lost that part of them which referred to the pathological examinations. The patient was a girl, aged 15, an only child, who somewhat lacked playmates and was devoted to a Persian cat. One evening shortly after having had an extra romp with the cat during which she had frequently buried her face in the cat's fur in the way children are so fond of doing, her eyes became suffused and she also developed a bad sneezing fit. The next day her eyes and nose were swollen and discharge began to appear, and by the evening, when I first saw the girl, the affection was acute. Both eyes were streaming with yellow purulent discharge and the lids were much chemosed. The nostrils were similarly greatly swollen and purulent; slightly sanguineous matter was freely oozing from them.

Cultures were taken of the discharge and also from the cat's fur. My recollection of the result, which as stated I have unfortunately lost from my case book, is that the *Staphylococcus pyogenes aureus* was in abundance in the eye discharge, and that the same organism was isolated from the fur.

Energetic treatment on conventional lines soon effected improvement, and the child eventually made an excellent recovery without any damage to the eyes.

It was for two or three days a case of great anxiety, as it was quite one of the most acute cases of purulent conjunctivitis that I have ever seen. One has, of course, to be careful in such cases before definitely assigning the cause, but here there seemed no other possible explanation as the girl was living in the best of circumstances and was perfectly well until the cat episode occurred. I need scarcely add that the cat met with an untimely end.

CASE II.

This case also occurred in a child of well-to-do people. The patient was a boy aged 14, and his case was extremely complicated and severe. The history was as follows: About a fortnight before I first saw the patient, a slight inflammation was noticed in the left eye, accompanied by slight discharge and a slight swelling over the left parotid. The local doctor thought that it was a case of mumps and the boy was isolated. The swelling however did not run the course of mumps, and as it gradually grew larger and the conjunctivitis increased in spite of zinc lotion, he was sent up to me. During this fortnight there was no fever and no pain.

When I saw him I noticed that the whole left side of the face was much swollen and that over the parotid there was a brawny induration not particularly tender, but with the skin slightly reddened over the angle of the jaw. Extending into the neck and almost continuous with the parotid swelling was another indurated mass evidently consisting of swollen glands. The lids of the left eye were considerably swollen and eversion for examination was difficult. When this was effected the conjunctival surfaces of both tarsi were seen to be fairly covered by coarse granulations especially marked in the upper lid, where, near the fornix, there were some bunches of exuberant granulation tissue. The retrotarsal portions of both sacs were much chemosed with great enlargement of the follicles, and a fairly abundant muco-purulent discharge lay in the furrows of the swollen tissues. The bulbar conjunctiva was also considerably swollen and rather pink in colour. The cornea and all other structures were quite healthy.

The cause and nature of the trouble seemed at first obscure. Naturally, suspicion of tubercle crossed my mind, but I dismissed it as improbable on account of the rapidity with which the disease had developed. There was, further, a history of a Persian cat of which the boy was very fond, and he was in the habit of walking about with it perched on his left shoulder; he cuddled it at irregular intervals. Systematic investigation was the only possible way of arriving at the causation, and in the meantime the boy was put under an anæsthetic and the disease treated by thorough cutting and scraping, finishing up by thoroughly swabbing out the upper and lower sacs with a 2 per cent. solution of silver nitrate. The boy did very well and the glandular swellings at once began to subside. However, steady treatment for about six weeks with argyrol, weak copper drops and an occasional touch of mitigated silver stick to spots where the granulations threatened to recur, was necessary before he became really well, and the glands were not completely normal again for a little while longer still.

Now as to the investigation. The scrapings were put into sterile tubes and submitted immediately after operation to expert examination, and from them were isolated (*a*) *Streptococcus longus*, (*b*) *Streptococcus brevis* and (*c*) *Staphylococcus albus*. Obviously the streptococcus was the important organism and examination was directed to seeing if this could be found in the cat. The question arose as to whether any other animal but the cat was likely to be a factor, and as there was also a pet dog in the house (of which however the boy was not particularly fond) it was decided to examine both.

Portions of the hair and swabbings of the skin were taken in each case. The dog's hair revealed (*a*) *Staphylococcus albus,* (*b*) *Bacillus subtilis* and (*c*) *Proteus vulgaris,* whilst from the skin swabbing were obtained (1) *Staphylococcus aureus* and *albus,* and (2) *Micrococcus catarrhalis.* In the cat the chief organism found in the hair was a *Staphylococcus albus,* whilst in the skin swabbing a number of organisms were found, the most important being (*a*) *Streptococcus brevis* and (*b*) *Staphylococcus citreus,* the other organisms consisting largely of *Bacillus proteus vulgaris* and the *Bacillus subtilis.*

It was therefore only in the case of the cat that an organism, a streptococcus similar to that found in the lid scrapings was discovered. This fact, coupled with the history already given of the boy's fondness for the cat gave the verdict unhesitatingly against the cat as the causative agent. The dog being found "not guilty" was acquitted, whilst the cat was summarily executed.

CASE III.

This case was unquestionably the worst of the three: for if the trouble had not been eradicated it might undoubtedly have led to the child's death. It occurred in a little girl aged 5. When staying with some friends of her parents at a place in the country to which there was a farm adjacent, she contracted a muco-purulent conjunctivitis of a mild type. The history of its onset was that it supervened very shortly after nursing a cat which was a great favourite with her and which divided its favours impartially between the child and the denizens of the neighbouring cowsheds. The conjunctivitis proved intractable to ordinary treatment and the child was taken to an expert for advice. Still treatment did not improve matters and after a time the submaxillary and sternomastoid glands on the same side began to enlarge. And so the case drifted on for two or three months, the eye apparently remaining in much the same condition of chronic mild conjunctivitis, and the neck trouble ever growing more formidable. Ultimately I was called in to see the child and on everting the upper lid I found a mass of exuberant cock's-comb granulations occupying the greater part of the retrotarsal tissue and trespassing on the posterior edge of the tarsal plate. The lower sac was perfectly healthy except for a little reddening and the lesion must have been discovered had anybody taken the trouble to evert the upper lid.

The clinical appearance combined with the history and enlargement of the cervical glands made me at once suspect that it was a case of conjunctival tubercle.

I at once took the child into a nursing home and under an anæsthetic cut and scraped away all the infected parts, finally with due precautions coating the whole operated surface with mitigated nitrate of silver stick. A certain amount of reaction followed as a matter of course, but warm boracic bathings and pads, with the free use of weak iodoform ointment answered very admirably, and the child made an excellent and complete recovery. I warned the parents that if the glands in the neck were tubercular and their condition resultant on the conjunctival growth, the scraping and cutting away of the latter would probably be followed by an outburst of inflammation in the glands, and this is precisely what happened. Three little operations in the course of the next few months had to be performed on glands which, in one case at any rate, broke down, but ultimately the neck cleared up thoroughly well, and now four years after the lid operation, the child is quite well, without the slightest sign of recurrence either in the eye or glands.

The scrapings were submitted to Dr. Browning for examination. He reported that direct smears made from the ground-up scrapings showed the presence of a very few bacilli, which were very short and fat, and resembled the bovine type of tubercle bacilli. Some of the scrapings were injected into the subcutaneous tissue of a guinea-pig, which rapidly wasted and died in a fortnight. The guinea-pig after death showed a small area of necrosis round the inoculation site with slight enlargement of the corresponding inguinal glands, but no other lesion. Microscopical examination of sections from the local lesion and from the glands showed abundant tubercle bacilli. Dr. Browning adds that " these tubercle bacilli were in his opinion of the bovine type and the rapid death of the guinea-pig from the inoculation of extremely few bacilli (only five were found in twelve slides of the scrapings after prolonged search) tends to prove their bovine origin."

The guilt of the cat could unfortunately only be fixed by circumstantial evidence, because in spite of my best endeavours I could never succeed in getting hold of it. The owners, indignant at the imputation cast upon their pet, and solicitous for its welfare, stoutly and perhaps advisedly, refused to allow even an examination of its fur and skin. Still I think the very great probability that the child was infected with the bovine type of tuberculosis, and the fact that the cat was a farm-yard cat, and was a pet of the child who was continually hugging and cuddling it, renders the ætiology of the case pretty clear and makes it fair to assume that the cat was the means by which the child was infected.

I have drawn the attention of the Section to these cases, not because there is anything specially new or interesting in them, for a fair number of similar fur infections of the eye already have been reported, but chiefly because I do not think the matter has been properly brought before the public, who do not sufficiently realize the danger of cats as a means of disseminating disease. The germ-carrying guilt of rats, mice and flies and other noxious creatures, which are in themselves a nuisance and are generally hated, has been cordially recognized, and means to deal with them by extermination are eagerly welcomed, but although I believe the cat is as bad an enemy in this way as any animal or insect, I fear that any attempt to exterminate these wandering nocturnal curses would meet with a hopeless opposition. I think the public, as a body, still believes in the fallacy of the cat being more cleanly than most other species of animals and still quotes the argument of the free use of its tongue and saliva on its fur to clinch the subject; and so I fancy the only thing to do is to impress more forcibly the fact that the cat as a pet is a source of danger, chiefly to children, who naturally love to cuddle it and bury their heads and faces in its septic fur.

(*February* 7, 1917.)

The Retinal Signs of Arteriosclerosis compared with those due simply to Increased Blood-pressure.

By P. C. BARDSLEY, M.B.

IN 1897, in vol. xviii of the *Transactions* of the Ophthalmological Society of the United Kingdom, Mr. Marcus Gunn published his monumental work on the retinal signs of arterial sclerosis. From the clinical side there has been little or no advance since. Mr. Gunn laid down four cardinal signs of sclerosis of retinal vessels, viz. :—

(1) A tendency to *tortuosity of the arteries*, especially the smaller vessels.

(2) *Variation in the calibre* of the vessels, especially sudden diminution for a short length passing again into normal size. The calibre is apparently sometimes narrowed by nodules in the vessel walls, imparting to the vessels a beaded appearance.

(3) *Alteration of the normal light streak.* This becomes very much brighter and very much more sharply defined.

(4) *Indentation of veins*, either by supra-pressure of the artery crossing above the vein, or infra-pressure from crossing below. When there is considerable indentation there is great obstruction followed by all the sequelæ of back pressure, viz., stasis, thrombosis, œdema, and hæmorrhages into the surrounding tissues.

It is necessary for the clear understanding of this paper to keep these four signs all the time before us: tortuosity; variation of calibre; alteration of light streak; indentation of veins.

These signs of Marcus Gunn's have been confirmed by the ophthalmoscopic examinations of hundreds of observers since; but no additional sign of any importance has been added. De Schweinitz emphasizes the brick-red discoloration of the disk as a late but important sign; this is due to the dilatation of the capillaries and is the consequence of the venous obstruction and the back pressure.

Mr. Gunn was undoubtedly one of the first who advanced the opinion that arteriosclerosis was not confined to old age, and that old age was not alone productive of these changes. The prognosis of these cases was at first regarded as very bad indeed. Some years back, however, I came to the conclusion that this dire prognosis did not apply nearly so universally as was at first supposed. In following up the after-history of these patients I found that some with very advanced mischief, such as considerable retinal œdema with hæmorrhages, improved marvellously under treatment, and in some cases, to my surprise, the cardinal signs largely disappeared. At times, also, cases were published in the journals, such as the following, which appeared in the *British Medical Journal* of August 6, 1910. The case was published by Dr. W. M. Crofton, lecturer in special pathology, University College, Dublin, and was entitled: "Recovery from Apparent Arterial Sclerosis." This is the gist of Dr. Crofton's publication:—

Patient, aged 60, manager of a large commercial concern, had led a strenuous life. He was very short of breath, and suffered from palpitation. A specialist diagnosed cardiosclerosis, and ordered him a sea voyage. His urine contained a trace of albumin, but no sugar. Owing to a feeling of weight on the top of his head and aching of the eyeballs, he was sent to Mr. Claud A. Worth. Mr. Worth's report was: "Retinal arteries are very small and tortuous. Central light streak very wide. Where an artery crosses a vein, the latter is so compressed as to be apparently interrupted. No retinal œdema. No hæmorrhages." Patient was placed under treatment for three months, after which he returned to work. Two months later he again saw Mr. Worth, who reported as follows: "Retinal arteries are large and have lost the 'silver wire' appearance. The appearance of interruption of the veins is much less marked; in fact, the arteries appear normal for a man of his years."

The publication of cases like this, and my own observations, compelled me to ask myself repeatedly this question: Can sclerosed vessels change in appearance in this manner? Are these cases which often show advanced signs (for surely back-pressure and œdema must pass as very advanced signs), are these advanced cases, which improve so much, incipient sclerosis, or are they sclerosis at all? We know that iodides may produce absorption of round-celled infiltration; and we may reasonably conceive of resolution of the hypertrophied muscle cells and elastic fibres; but are we justified in expecting the disappearance of organized granulation fibres and connective tissue? General experience answers—no. May not the signs, then, be due to some cause other than sclerosis?

Again, I observed that these changes could occur with *startling rapidity*. I saw patients, whose eyes I had carefully examined only a very short time before (in some cases only a few days), and whose vessels had appeared perfectly healthy and normal, and I saw those patients after a severe attack of influenza, scarlet fever, or some other toxæmia, develop these signs of retinal sclerosis, with deep indentation of veins, and a macular œdema sufficient to reduce their vision from normal to $\frac{6}{12}$. It was impossible to believe that an advanced fibrosis had occurred in a few days, nay, in a day or two. It was equally impossible to believe that these signs could be due to round-celled infiltration preliminary to fibrosis, for in many cases, after lasting for months, the signs largely or entirely disappeared. In these months the infiltration would surely have become organized.

I became certain, then, that these cardinal signs of Marcus Gunn did not *necessarily* indicate arterial sclerosis, but were often due to some accessory cause.

Many years ago at Moorfields, when observing these cases, I began taking the blood-pressures of the patients with a Riva-Rocci manometer. In nearly all the cases the blood-pressure was raised considerably above the normal, and in many cases excessively so. Often the patients sought advice for headaches which they thought were due to their eyes, but which were not relieved by suitable lenses. I commenced treating these patients with depressor drugs, strict diet, exercise, baths, &c., as recommended by the various authorities on blood-pressure. I noticed that when I was successful in lowering the blood-pressure to any considerable extent, along with the relief of the head symptoms, the ophthalmoscopic signs of retinal sclerosis appreciably diminished. Increased blood-pressure, then, accounted for some of the cardinal signs. When the toxic cause of the high blood-pressure was traced and was successfully removed by methods such as the complete clearing of the mouth of septic stumps, the improved changes in the retinal vessels were still more remarkable.

If, then, some of these cardinal signs were produced by the high pressure of the blood alone without sclerosis, while other signs were due to sclerosis, it became important to decide if it was possible to distinguish between the changes due to the simple raised pressure and those due to the more serious sclerosis. In the discussion on retinal vascular disease at the Ophthalmological Society, during the Session 1912-13, I ventured to state that I thought it was possible with the ophthalmoscope to distinguish between the signs of high tension and the signs of angiosclerosis.

The following seem to me the distinguishing characteristics. In simple high tension :—

(1) The vessels have an appearance of *uniform* distension and fullness.

(2) The light streak is *broadened* out: it may be greatly increased, apparently reaching almost the whole breadth of the vessel.

(3) The light streak is very much brighter than normal, the brilliancy increasing with the increase of the tension, until with very high tension it becomes like bright copper wire (not silver wire).

(4) The tight arteries indent the veins; with medium high tension they indent them slightly, with very high tension they indent them deeply, leading to back-pressure and all its consequences.

The following signs indicate sclerosis :—

(1) *Irregular* tortuosity, especially of the smaller twigs.

(2) Increased brilliancy of the light streak, while at the same time the light streak appears *narrower* and more central.

(3) Irregularity of calibre and beading are sure indications of sclerosis.

(4) General diminution in the size of the vessels and "silver wire" reflex show advanced sclerosis.

Now, of course, these two conditions of high tension and sclerosis very frequently coincide, but not by any means always. I have seen cases of definite early sclerosis of the retinal vessels with only slightly raised blood-pressure. The blood-pressure has been suddenly raised by some toxic infection, or by artificial means, and the above signs of high tension in the retinal vessels have been added to the previous signs. These signs have again disappeared on lowering the blood-pressure or eliminating the toxic cause. On the other hand, in advanced "silver wire" sclerosis, I have never seen the signs of sclerosis removed. I have seen some diminution in the intensity of reflex when the vascular pressure has been lowered by drugs, or the heart pressure has failed; the ophthalmoscopic signs of sclerosis always remained in evidence.

The question whether *continued* high blood-pressure induces sclerosis perhaps scarcely concerns us here. But, for my part, I do not think it necessarily does. For instance, there may be a raised pressure from aortic disease, with perfectly compensated hypertrophy. This may last for a lifetime without any signs of vascular sclerosis becoming evident. Again, in myxœdema the blood tension is raised (probably from the imbalance of the suprarenal and thyroid secretions) without signs, that is, retinal signs of sclerosis. When continued high tension is followed by sclerosis this sclerosis may be due to the same toxin which caused the high tension. Now, to confirm the above deductions, I called in the assistance of my House Surgeon, Mr. du Toit. We took a number of cases in the Salisbury General Infirmary, and artificially raised the blood-pressure. We selected, as far as possible, healthy cases from the surgical side of the Infirmary, such as males admitted for radical cures of hernia. We carefully examined the retinal vessels of each patient by a good illumination from a fixed light, and with a mydriatic in the eyes; and we made careful notes of the conditions of the vessels. We then took the blood-pressure with a manometer and noted it carefully from two or three examinations. We next administered a hypodermic injection of 5 to 8 minims of adrenalin chloride in normal saline, and the blood-pressure was recorded at intervals until it was found that there was no further rise. This was roughly one to one and a half hours after injection. Some cases responded well, the blood-pressure rising 40 to 45 mm.; others to a lesser extent, with a rise of 20 to 30 mm.; and in some there was no rise of blood-pressure after the injection of adrenalin chloride. When the pressure was considerably raised, then another careful observation of the retinal vessels was made and a description of them accurately noted down.

As these experiments can easily be repeated by any ophthalmic surgeon, further details are not of any value.

From this artificial raising of the blood-pressure, we observed in the retina :—

(1) Increased fullness of the arteries.

(2) Increased brilliancy of the light streak.

(3) Increased breadth of the light streak.

(4) (*a*) Indentation of veins, where previously not indented; (*b*) increased indentation of veins (in a few cases, very much increased), where previous slight indentation existed.

(5) The reduction of all these signs on the return of the blood-pressure to its former level.

From long experience, and from the above experiments, I think it is even possible to indicate roughly the actual height of the blood-pressure in millimetres of mercury from the observations of the retinal vessels alone. Where there are no definite signs of sclerosis, I think: (*a*) very slight indentation of veins, full arteries with broad light streak, indicate 145 to 150 mm.; (*b*) very brilliant broad light streak with deeper indentation and slight signs of obstruction indicate 150 to 160 mm.; (*c*) very brilliant broad light streak with apparent obliteration of veins indicate 160 to 180 mm. Where the signs of advanced sclerosis are present, the veins may be indented and nipped at lower tensions.

In conclusion, there are, I think, one or two pitfalls which it is necessary to avoid :—

(1) *The Pitfall of Faulty Examination.*—In a case of high arterial pressure, it is frequently a matter of great difficulty to ascertain whether thickening of the vessel wall is present or not by a *digital* examination of the superficial vessels. It is here that the ophthalmoscope plays so important a part. The vessels can be seen as they are in life, and by the direct method of examination the image becomes magnified about fourteen times. Hence the skilled ophthalmoscopist is able to detect change from the normal of a very slight amount, although to the inexperienced observer only very gross changes are detectable. Here lies the pitfall: Errors of refraction, especially high errors, blur the picture, and unless they are carefully corrected, the interpretation of what appears is fallacious.

(2) *The Pitfall of Acute Toxæmia.*—In patients suffering from very severe toxæmia, we *may* see in the retina: (*a*) Broad arteries; (*b*) increased light streak; (*c*) engorged veins; (*d*) some very slight indentation of these engorged veins. Yet the blood-pressure, as shown by the manometer, is abnormally low. Such a condition one may see, for instance, in an acute Bright's disease, a very severe influenza, &c. The explanation of the appearance of the retinal vessels is, I think, due to: (*a*) relaxation of the vasomotor control of the arteries; (*b*) dilatation of the heart, with loss of its muscular power; (*c*) consequent engorgement and stagnation of the venous system. This general condition is due to the toxin circulating in the blood. In several of these cases I have listened to the heart's action, and found the sounds so weak as to be almost inaudible. On administering small doses of digitalis, with an apparent general improvement in the patient, the blood-pressure has gone up with a jump, say, from 90 to 140 (this without any marked diminution of the albumin excreted in the albuminuric cases).

(3) *The Pitfall of the Failing Heart.*—A somewhat similar pitfall exists in cases of prolonged high tension with sclerosis, in which the heart's action suddenly begins to flag. In such a case the retinal signs would indicate to the careful observer a fall in the blood-pressure from what it previously had been, *yet* those signs would point to a higher pressure than the manometer would give. Why is this? Again because: (1) with the failing heart, the stagnation of the blood stream produces swollen veins; (2) owing to the hardness of their walls the arteries remain rigidly fixed; (3) the swollen veins *appear* to be obstructed by the rigid arteries. Keeping in mind these three liabilities to error—viz., faulty examination, acute toxæmia, the failing heart—I think it is possible for the ophthalmic surgeon to distinguish by means of the ophthalmoscope between increased blood-pressure and arteriosclerosis, and to base his prognosis and treatment thereon.

DISCUSSION.

Mr. HERBERT PARSONS: I do not wish to criticize the paper, but I should like to draw the attention of the author and the members generally to some work done by Mr. Foster Moore, which has just been published in the *Quarterly Journal of Medicine*,[1] and which I have had the opportunity of reading. That work bears directly on what Mr. Bardsley has told us, and it is an extremely important contribution to the subject. I mention it because it is published in a journal which is liable to be overlooked by ophthalmologists.

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[1] *Quart. Journ. Med.*, Oxf., 1916-17, x, pp. 29-77.

Mr. J. B. LAWFORD: This paper of Mr. Bardsley's is a very valuable contribution to the ophthalmoscopic evidence of vascular changes. I had the privilege of being a colleague of the late Mr. Marcus Gunn at the time he was observing the cases which he subsequently published, and I saw a great many of them. As probably every one will agree, Mr. Gunn was one of the best ophthalmoscopic observers we have ever had, and I consider that Mr. Bardsley has proved himself an apt pupil of his teacher. At the time, I accepted Mr. Gunn's statements fully, especially with regard to prognosis, in the class of cases he described. But not long afterwards I had it brought to my knowledge that the prognosis was not so grave, at all events, in all cases as Mr. Gunn led us to suppose. One saw cases—and I saw one or two which had been under Mr. Gunn's own observation—in which a bad prognosis had been given because of appearances denoting severe, or fairly advanced, arterial changes, possibly not pure sclerosis as was then thought, in which the opinion given was not justified by subsequent events; the patients lived for several years, and their health improved in many ways. There is no doubt whatever that Mr. Bardsley is right in his assertion that there are changes which, ophthalmoscopically, are not very different from those of arteriosclerosis but which have not nearly such a grave significance, and that if we observe carefully enough—as carefully as he has done—we shall be able to distinguish, at all events in very many instances, cases of true arteriosclerosis from those in which the appearances are due to abnormally high arterial tension.

Mr. D. LEIGHTON DAVIES (Cardiff): A short time ago I was engaged in examining the fundus in all cases of cerebral hæmorrhage at the workhouse at Cardiff, and I was struck by the very slight signs shown of retinal arteriosclerosis. It was very seldom that I found advanced signs. One of the commonest features I have come to look upon as indicative of arteriosclerosis is, not so much the blocking or indentation of the veins, as the redness of the disk: this redness was present in all those cases. And there was a certain indistinctness of outline in the arteries, not amounting to a difference of calibre. Here and there it was difficult to say where the margin of the artery ended, and where the retina started. But the point to which I should like to draw attention is, that in these cases we seldom see very marked indentation of veins. I took the blood-pressure frequently, and the systolic was often well over 200 mm. of mercury, and the diastolic 140 mm. Those persons obviously had generalized sclerosis: they were old people aged 60 to 70. It is very difficult to make any forecast as to the duration of life. Yesterday I saw the widow of a patient whom I examined in 1913 because of slight obscuration of sight. His age was 66, and he had worked very hard. He had slight signs of arteriosclerosis. In his case there was obliteration of the outline of the arteries, redness of disk, and slight tortuosity of small branches. He died in three years.

I told his medical man he might have a stroke, and he had three strokes last Sunday. Yet his blood-pressure was not very high, only 155 mm. There are cases which have been on one's book ten years with the same symptoms, and yet the patients still remain well. So it is difficult to discriminate between the cases that are likely to do badly and those that will probably keep well.

Mr. BARDSLEY (in reply): This paper was written nearly three years ago, and at that time I broke down in health. I have not read Mr. Foster Moore's contribution, but I shall have great pleasure in doing so.

Section of Ophthalmology.

President—Mr. William Lang, F.R.C.S.

(*June* 13, 1917.)

DISCUSSION ON THE ÆTIOLOGY AND TREATMENT OF IRITIS.

Opening Address by the President.

At the present time, when everything is in a state of flux and change, I think it will be of service to review the ætiology and the treatment of iritis. If we all agree as to the cause of disease in the majority of the cases of iritis we shall be in a strong position, should it appear politic, to advise the proper authorities to introduce measures which would prevent much ill-health, great loss of sight, and untold injury to the community.

To ascertain the causes which I found in the last 200 cases of iritis occurring in my private practice I have made a list of these causes and the number of cases assigned to each. They were :—

	Cases	Percentage
Syphilis	12	6·0
Gonorrhœa	24	12·0
Tubercle	22	11·0
General affections ...	17	8·5
Local affections ...	51	25·5
Pyorrhœa	74	37·0
	200	100

Syphilis, which was formerly thought to be the chief cause of iritis, occurred only in 6 per cent. of the cases—in hospital practice it would probably be higher—but I think we may look forward to a time when it will be the rarest of the causes, thanks to modern methods of treatment, which make gummata of the iris, and of the ciliary body even, melt away without, as formerly, disorganizing the eye.

	Male	Female	Aged
Syphilis	12	—	22 to 60
Gonorrhœa	22	2	22 to 53
Tubercle	10	12	2 to 50 ; 20 cases between 16 and 35

Gonorrhœa, with its 12 per cent., is higher than is generally conceded, but in a general hospital it would be higher still. The description by Mackenzie of gonorrhœal iritis with its attendant rheumatism is still a classic, and until quite recently no advance had been made on his method of treatment, but since the infection has been found to persist in some portion of the genito-urinary tract for an indefinite number of years, relapses, the chief feature of the disease, can be prevented by local treatment applied to this source.

For this advance we must thank the surgeons who have paid attention to these incompletely cured cases of gonorrhœa. We now know that as long as the joints, tendons and fasciæ are painful, and attacks of iritis occur, there is some point in the genito-urinary system which is still affected.

It should be remembered that other sources of infection may complicate these cases, such as pyorrhœa, which can cause a relapse; also that organisms, other than the gonococcus, may be present in the genito-urinary tract.

Tubercular iritis was present in 11 per cent. of the cases: ten in males and twelve in females. It occurred at the average age of 25, all except two being between 16 and 35. These exceptions happened, one in a child aged 2, with a discharge from the ear which may have complicated the disease, the other in a woman aged 50, who, in addition to a well-marked tubercle of the iris, said she suffered from having an ancestor who had been cursed by a saint with special reference to the eyes, and ever since some member of the family had been blind.

The treatment for tubercular iritis is the same as for tubercle of the lung—good air, graduated exercise and food rich in fats, as well as local measures to subdue inflammation and prevent closure of the pupil.

GENERAL AND LOCAL AFEECTIONS.

Gout, 7; diabetes, 5; herpes of the fifth nerve, 3; influenza, 1; pneumonia, 1.

Skin, 10 (ulcers, 4; acne, 2; eczema, 2; boils, 1; insect bite, 1).

Mucous surfaces, 10 (middle ear, 1; frontal sinus, 1; antrum, 1; lachrymal sac, 1; tonsils, 6).

Peritonitis, 1.

Alimentary tract, 23 (gall-stones, 1; dysentery, 1; appendicitis, 1; colitis, 3; constipation, 17).

Genito-urinary tract, 7 (cystitis, 2; after each confinement, 2; vaginal discharge, 1; prolapsed and ulcerated uterus, 1; myoma, 1).

Injury, 1.

Sympathetic ophthalmia, 1.

Seventeen cases occurred with gout, diabetes, herpes of the fifth nerve, influenza and pneumonia. Ten were associated with some septic focus in the skin, or a mucous surface or cavity such as the middle ear, frontal sinus, antrum, lachrymal sac. The tonsils were affected in six. An affection of the alimentary tract was found in twenty-three, such as gall-stones, dysentery, appendicitis, colitis and constipation. The genito-urinary system provided seven—cystitis, perineal fistula, associated with each confinement, discharge from the vagina, ulcer of the uterus in a case of prolapse, myoma. A smart blow on the eye caused one case and a sympathetic ophthalmia another.

PYORRHŒA—24 MALE, 50 FEMALE.

Years	Cases		Cases
10	1	Pyorrhœa and eczema	2
20	5	,, ,, diabetes	2
30	14	,, ,, gout	2
40	15	,, ,, herpes of the fifth nerve	2
50	26	,, ,, tonsils	3
60	9	,, ,, constipation	8
70	3	,, ,, appendix	1
80	1	,, ,, ulcer of the uterus	1
		,, ,, tubercle	1
	74		22

Pyorrhœa was the sole cause to be found in seventy-four cases. When the patient was seen at the beginning of a first attack, the rapid recovery that took place after the removal of the affected stump, tooth or teeth, was very striking. No other treatment except atropine and heat was used. Twenty-two of the other cases had pyorrhœa as a complication—if these are added, 48 per cent. had their mouths affected.

In tabulating the cases where pyorrhœa appeared to be the sole cause of the iritis, it is interesting to note that there were twice as many women as men, and that the age incidence was very slight before 30, from 30 to 60 it increased, with a very sharp rise between 50 and 60, and almost ceased after 60. It will be of great value and interest to hear what our confrères of the Section of Odontology have to recommend as a preventative of this appalling state of affairs, which, starting in early childhood, pollutes the individual throughout life, or as long as he has any teeth in his jaws—all the time laying the seeds of numberless diseases in every part of the body, and many others in the eye beside iritis; in fact no structure of the eye escapes.

Sir ANDERSON CRITCHETT, Bt., C.V.O.

With the very limited time at my disposal, perhaps my few remarks will be more useful if I confine myself practically to the question of the treatment of some of these cases of iritis.

I dare say many will remember, nearly forty years ago, that Sir John Tweedy made the suggestion that in many instances where atropine proved ineffective, the sulphate of duboisine was a more powerful mydriatic, and in some cases I have found that where atropine was practically powerless, I have been able to break down synechiæ with that still more powerful drug. It is never necessary to use more than 2 gr. to the ounce, and that is the practical equivalent of 6 gr., or even 8 gr., of atropine. It is important to be careful that it does not go down the duct into the throat, because in some instances the toxic effects may be rather alarming. Then, I am old-fashioned enough still to believe that leeches, in the early stages of acute cases, are extremely useful; and in the more chronic cases, keeping small open blisters on the temple is sometimes of very marked benefit.

I see that the President has alluded to the question of gonorrhœa as a cause of iritis. Undoubtedly it is a very frequent cause, and I would like, here, just to pay a little tribute to the memory of my old colleague and pupil, John Griffith, who was one of the first to follow out suggestions of Mackenzie, and who read an excellent paper on this subject. When he died, we lost a very valuable member of the ophthalmic world.

Then I come to the question of the advantage or disadvantage of iridectomy. Some thirty years have passed since Mr. Nettleship introduced this subject. Those thirty years have gone and, I am sorry to say, our distinguished colleague has gone with them. The following is a short extract from the paper which he then read. With reference to iridectomy he said:—

> "Making every deduction for sources of error, and allowing also for the proneness of patients to attribute benefit to any active treatment, I feel little doubt that iridectomy does confer real good in some cases of iritis, and this whether an operation be undertaken during the active inflammation, or in the intervals between the attacks. The benefit sometimes takes the form of a very long term of freedom, sometimes an increase in the length of the inter-iritis periods, and sometimes a diminution in the severity of the attacks."

He then goes on to say that the cases where, in his opinion, iridectomy is contra-indicated are those of keratitis punctata, the chronic thickening of the iris, with very extensive synechiæ and the existence of myopia. And these, in his opinion, were indications that iridectomy was not likely to be well borne, even if a good piece of iris could be removed. He finishes by saying:—

> "I am, therefore, clear that it is our duty sometimes to advise iridectomy against recurrent and obstinate iritis. I feel sure that disappointment of both the patient and the surgeon would often be avoided if the operation be held in reserve until all other plans of treatment have been patiently tried."

With reference to my own rather long experience, I do not wish to speak in any exaggerated terms, but I think I may safely say this: that few things have impressed me more than the extraordinary value of iridectomy, both as a preventative and as a curative agent, in those cases for which it is specially intended. But, and where you have to deal with a half-rotten, friable, and in some instances "*bombé*" iris it is rather a big "but," the iridectomy, to be thoroughly effective, must be a good one.

As it is very necessary to have perfect quiescence on the part of the patient, I almost invariably give a general anæsthetic. I prefer to use a keratome, because I think it makes the cleanest cut, and because with it I think you can best measure the size of your wound. In introducing the iris forceps, I think it is necessary, in most instances, to go down almost to the pupillary margin, and then comes a gentle, almost coaxing, withdrawal of the forceps with a piece of included iris, and one clean cut with the scissors. I am old-fashioned enough to prefer the scissors that we used to have at Moorfields, set at right angles for the right eye, and curved for the left, though I believe many men prefer De Wecker's scissors. I prefer to keep those for the operation for which they were originally intended—namely, iridotomy. If time permitted I could quote a very large number of cases in support of my belief in iridectomy, but I should like briefly to mention one case which has occurred in my practice within the last three years. A patient was sent to me by a general practitioner in the hope that I might possibly be able to save the last lingering portion of the remaining eye. The iris of the first eye was absolutely "*bombé*," and there was a closed pupil. In the second eye there was one small interval where I thought it was possible to remove a little piece of iris, and, to use a sporting metaphor, I "won by a short head on the post." Of course, I gave a general anæsthetic, and, I am glad to say, I got away a little piece of iris, leaving a quite respectable coloboma. The history of the case had been that repeated attacks had taken place over a period of four or five years, and the curious part, to me, was that the patient had been in the hands of a very able ophthalmic surgeon, whom I also knew to be an excellent operator. He is not here to-night, so no withers need be wrung. He had used atropine and perhaps other mydriatics: but he had watched this case go slowly from bad to worse. I have seen the case three times since, and I have heard from the general practitioner on several occasions, and, I am glad to say, no further attack of iritis has taken place in that eye. My first impulse was to write to the ophthalmic surgeon, but on second thoughts—and they are very often the best—I decided that he might think me guilty of swagger and impertinence, so I refrained. But it is just possible that the words I am speaking to-night may reach him through our *Proceedings*. Of course, he may still think he was in the right and I am in the wrong: but I am not without a lingering hope that if he should read these words and another similar case should come into his keeping, he may, perhaps, give a chance to iridectomy.

Mr. J. G. TURNER.

The relation between diseases of the teeth and diseases of the eyes has interested me since the time when I worked at the Royal Westminster Ophthalmic Hospital as clinical assistant to the late John Griffith. Our object was to find out what influence septic teeth had on eye diseases. We had concluded that corneal ulcers were often very favourably influenced by extraction of such teeth when, to my great grief, John Griffith died.

It seems we are all agreed as to the infective origin of the vast majority of cases of iritis. The problem is to find the source of infection. The mouth, I believe, is far the commonest offender, though some rhinologists claim the horrid pre-eminence for the nose. In civilized communities there is hardly an individual who does not present some degree of dental sepsis. The less common sources of dental infection are abscess of the crypt of erupting wisdom teeth or of buried teeth in any part of the jaws, suppurating antra and cysts of dental origin, visible ulcers of the mucous membrane and gums. Far the more common are the marginal gingivitis and hidden ulcers of "pyorrhœa," the abscesses and chronic osteitis due to dead and septic teeth and roots, the inflammation and ulceration of the gums accompanying tartar, and the artefact inflammations and ulcerations due to rough and overlapping fillings and to badly made crowns, gold caps, and "bridges."

That dental sepsis is not more frequently recognized and incriminated is due, I believe, to its great prevalence. The abnormal is so common that it is accepted as normal. Its very prevalence makes many doubt its power for ill. More careful clinical instruction in the details of dental sepsis is urgently needed in our medical schools.

The tooth is the determining factor of dental sepsis. Infection may enter by way of the pulp cavity, following the track of dental caries; or by way of the tooth-socket, gaining entrance at the neck of the tooth, where the gum edge laps round it. When infection enters by way of the pulp cavity, once the root-canals are infected it is practically impossible ever to sterilize the root. Infection spreads radially in the minute dentinal tubules, and no means has ever yet been found of following up this infection and ensuring asepsis of the infected dentine. Infection spreads along the root-canals, and these are by no means always single straight canals running direct to the apex of a straight root. Often the canals are flat or dumb-bell shaped, or break up into branches or even a net-work towards the apex of the root, or turn off sharply at an angle to end near the apex, but not at it, as required by our cleansing instruments. The roots themselves are very generally curved, and the root-canals follow these curves. I have examined large numbers of "dead" teeth and roots after extraction, and I doubt whether I have ever found one tooth or root which did not show signs of having set up inflammation around it. There is either granulation tissue adherent to the root, exostosis of the root, or absorption of the root—all denoting that the root was abhorrent to the surrounding tissues. The plain fact is that when we are filling or crowning a tooth that has once been septic we are taking our chances. An "eye for an eye and a tooth for a tooth" may be right, but an eye for a tooth is a foolish bargain!

When infection enters by way of the neck of the tooth, the first stage is the stagnation of germs, favoured by sticky food, on the neck of the tooth. Marginal gingivitis follows, and the gum edge which in its perfect condition should almost adhere to the tooth-neck, swells away from the tooth and opens a path for infection of the tooth socket. The now infected periodontal sulcus is an undrainable area, and tissue destruction proceeds at varying rates till pockets are formed, the alveolar bone being destroyed, leaving the gum still surrounding the tooth. (Where gum and bone destruction proceed at an equal rate the chances of infection are far less.) On the toothward side of this gum-flap there is always ulceration, however healthy the part may be to outward view. I have cut away large numbers of these gum-flaps and have always found ulceration on the toothward side, and it is, I believe, chiefly through these ulcers that infection, whether toxic or living, gains entrance. For a long time I tried unsuccessfully to stain bacteria *in situ* in these granulation-covered ulcers. At last I asked Dr. Plimmer to help me, and he at once stained organisms in the tissues of the ulcerated gum-flaps, showing their power for evil. Add to this that the pockets are filled with decomposing food and débris and we have here a further, and I think, an important source of injury.

If we accept the modern pathology of infection it seems clear to me that dental sepsis must be eradicated not only in cases of iritis but in the case of the large majority of diseases. I may here remind you that it is quite possible to live comfortably without teeth of any sort, and that tooth-plates may be a serious source of infection, since it is extremely difficult to keep them free from a greasy sour-smelling coating of germs and decomposing food.

Your President asks as to prevention. This is a very difficult subject. Cleanliness is the great preventive, both of dental caries and of "pyorrhœa." Unfortunately cleanliness of the teeth is extremely difficult to attain. The shapes and positions of teeth render the stagnation areas very awkward to reach. The usual brushing of the labial and buccal surfaces of the teeth is almost valueless, and the damage is done before the patient's attention is drawn to the deficiency of his methods. The details of tooth cleaning are too lengthy to enter into here, but some day it may be part of a nurse's (children's nurse's) training to learn how to clean teeth. If we could do away with sticky flour we should do away with far the greater part of dental sepsis. There is also the possibility of extracting teeth to free the remainder, and so render them more "drainable." Unfortunately the best tooth for this purpose is the first permanent molar, the largest tooth of our set. The best age for extraction is between 16 and 20. Clinically, I have seen many cases where this tooth has been extracted at this age on one side allowing the remaining teeth of that side to space themselves. The extracted side at the age of 40 has remained free from caries and "pyorrhœa," while the unextracted side has been badly affected by both diseases. Unfortunately the explanation of this result is too lengthy to be entered upon.

Dr. LYON SMITH.

I feel great diffidence in taking part in a discussion on iritis with experts, but I have been specially interested in the subject because of its incidence in arthritic conditions, a subject upon which I have been making bacteriological investigations for the past eight years. The evidences which I have been able to obtain that bacteria or their toxins were the chief causes of arthritic conditions have been brought out in the study of vitiated conditions of the blood. I think most of these are brought about by bacteria, although I suppose, as Mr. Turner has just said, foods and other causes may alter the state of the blood. But at any rate so far as the prevention of this condition of iritis is concerned, there is one important element: bacteria and toxins prepare the ground, but it is the element of strain or injury which determines the site, whether it be a joint, a muscle, a nerve, or the eyeballs. So I have considered it sound practice to recommend every arthritic person to have his refraction carefully tested by an expert, and I think it is quite possible that a number of cases of iritis might be prevented if eye-strain were avoided.

For a long time people have supposed that tubercle bacilli, gonococci and the syphilitic virus were the chief organisms capable of setting up iritis or other inflammations of the eyeball; but, as we have just heard, the bacteria of pyorrhœa and those concerned with nasal catarrh, bronchitis, colitis, urethritis, salpingitis, &c., are all equally capable, either through direct infection by bacteria or by the circulation of their toxins or their ferments in the lymph, of giving rise either to conjunctivitis or to more deeply-seated inflammations of the eyes. In August, 1915, I published a short paper, giving an account of a test, by direct hæmolysis, as a method of detecting bacterial toxins in the blood. The statements I made there have not been publicly controverted, so far as I know ; I suppose that at the present time everyone is too much pre-occupied to test the truth or fallacy of the deductions which I then made. I have made over 450 examinations of various bloods, most of them from people who have been suffering from chronic rheumatism or gout. Amongst that number, I find there were eight cases in which iritis was a secondary trouble. A summary of the bacterial findings in these eight cases is as follows: The influenza bacillus or toxins were found in four cases, the toxins of tubercle bacillus in only three, and gonococci in two only. Toxins of streptococci and staphylococci were detected *in all* the eight cases, and *Bacillus pyocyaneus* was present in three of them. These two organisms—*Bacillus pyocyaneus* and the influenza bacillus—give off toxins which are nearly as depressing to the vitality of the body as those of tubercle. *Bacillus pyocyaneus*, for example, is a very common inhabitant of the alimentary canal in otherwise normal people. It is not easily detected in the excreta, nor in cultures from them, because it is usually smothered by coli organisms, which grow more readily. But in the blood tests of which I am speaking, it shows up very quickly, and a positive reaction is sufficient to give one a clue for a more elaborate search. The same holds true of the influenza bacillus, which produces a great variety of toxins that are specially prone to attack nerve tissues. I think iritis is a not infrequent sequel to a severe attack of influenza.

The only other point on which I have to remark is in reference to the treatment of these conditions by the addition of inoculations to the general treatment. If these are adopted—and I have seen them effective in more cases than I have quoted—it should be remembered that although in other parts of the body it is a good thing to set up a sharp reaction by giving fairly strong doses, yet when one comes to deal with eye conditions, marked reactions are too dangerous, because of the risk of precipitating a glaucoma. For example, with tuberculin, we should begin with a dosage of something less than the $\frac{1}{250000}$ mg. I have heard such a quantity described as negligible; it is scornfully stated to have no effect, one way or another. But if we investigate some experiments in colloid chemistry, we see how easy it is to demonstrate the effect of even billionth dilutions in entirely altering the character of a colloidal emulsion.

There was one other coccus I found, which was described as active in production of arthritis by Warren Crowe, named *Micrococcus* *deformans.* It is certainly a very potent organism, because in a rheumatic person infected by it if you give even half-a-million of this coccus most violent reactions may follow. In two of the cases this organism was present, and a very small proportion of it was included in the compound vaccine which I prepared for the patients.

Captain A. W. ORMOND.

There is one matter to which I would like to draw the attention of the Section. A challenge was thrown down some time ago as to rheumatic iritis, and I do not think it has ever been taken up. I noticed the President omitted it to-night. Does acute rheumatism—i.e., rheumatic fever—ever produce iritis at all? The argument is, that considering the thousands of cases of acute rheumatism which occur every year in London, and everywhere else, the number of recorded cases of iritis associated with acute rheumatism is negligible: I do not think there are more than two or three. Therefore in the cases referred to by the last speaker as "rheumatic," I presume he means they are so in the sense of having some arthritic condition, but not in the sense that they are due to the *Micrococcus rheumaticus.*

It appears to me that iritis is always the result of sepsis: due either to the organisms themselves or their toxins. If that be granted, it helps us very much in the matter of ætiology. I do not think it possible that any error of refraction or eye-strain can produce iritis.

The President mentioned, I am sorry to say, the question of gout. I do not know what gout is: I cannot make out, from books, that anybody has a clear idea what they mean when they speak of gout. Is it a bacterial condition? If so, I suppose it is possible that it can cause iritis. It does not seem clear whether gout is a microbial or a chemical condition. I am very sceptical indeed about gout ever causing iritis.

Another point about which I should have liked to hear opinions is, as to the length of time that the gonococcus can be demonstrated in the tissues. If, as has been claimed, the gonococcus remains in the crypts of the prostate, and similar places, for ten or fifteen years, and is capable of producing trouble after that interval, does that coincide with what is generally known of the life-history of the gonococcus in other tissues? I was talking with a genito-urinary surgeon this week, and he said the gonococcus could not live on indefinitely in the tissues.

If that be true, then these late cases must be due to something else, either associated with the gonococcus, or independent of it.

I have to thank Sir Anderson Critchett for his suggestions with regard to leeches. He spoke of them as an old-fashioned remedy, but I find leeches extremely useful; the difficulty consists in obtaining them. What I have also found extremely useful is the hot-coil: dry heat passed through a pad by means of a weak electric current; the heat is maintained at a uniform level, and the pad can be kept on continuously for twenty-four hours, or several days. It greatly relieves the pain of iritis.

Mr. Ernest Clarke.

I should like to make one remark in support of what Dr. Lyon Smith said. Captain Ormond said he did not believe that errors of refraction could be a cause of iritis. You cannot say that a badly-fitting boot is a cause of gout, but the imperfect boot ensures in the metatarsal joint of the big toe the manifestation of the gout which is already in the system. It is in that way I believe eye-strain operates in the onset of iritis. There may be many factors tending to cause iritis; but eye-strain may be the determining cause of the site being the iris. For the last twenty-five years I have been very careful to estimate the refraction of my patients with iritis when the attack has subsided, and I could bring you notes of many cases of recurrent iritis which have benefited enormously by the use of proper glasses: in the majority of those cases recurrence has been absolutely stopped. Some of the patients were going to submit to an iridectomy to stop attacks, but I have persuaded them to try glasses first. I do not say this to discountenance iridectomy, because that may, after all, be necessary, but to emphasize the importance of remembering the factor of eye-strain.

Dr. C. E. Lakin.

From the pathological point of view there are two important questions which need consideration. First, why should patients suffering with systemic infections develop iritis? Secondly, is such an iritis microbic or toxic in nature?

With regard to the second of these, I cannot recollect any instance in which the mere presence of a toxin was responsible for a local out-pouring of an inflammatory exudate. An inflamed iris becomes discoloured for two reasons: first there is the increased vascularity attendant upon any inflammatory process, and secondly there is the presence of a more or less abundant exudate. I cannot at the moment think of any condition in which the mere presence of a poison is sufficient to determine the local exudation of an inflammatory fluid. So I strongly support the view that in iritis we have an actual microbic infection, and, moreover, we have an embolic process at work. That is to say, organisms entering the circulation from some quarter are carried by the blood-stream and are entangled as minute emboli in the iris.

We are now brought back to the first question, why should the iris be one of the spots picked out by these organisms? I think two reasons have been put forward. One is, that at the junction of the iris and ciliary body there is a change from a highly vascularized tissue to one relatively poorly vascularized, with the result that there is a diminution in available oxygen, and in consequence a diminished resistance to invading organisms. I do not know whether ophthalmologists can cite cases in which iritis has commenced at the junction of the iris and ciliary body, if so they would favour this view.

But I think the second view which has been put forward is well worthy of consideration. It is that the iris is vascularized by what to all intents and purposes is a terminal artery. We have the branches of the anterior and posterior ciliary arteries converging towards the pupil and forming an anastomotic circle. From this circle still smaller vessels are given off, which eventually form a network around the pupil. With such an anatomical fact in view, iritis, I think, becomes comparable to that condition which we sometimes see in young children who have received an injury to the lower end of the femur. I refer, of course, to that alarming series of events which we speak of as acute osteomyelitis or acute necrosis of bone. The main artery of supply to the femur after entering the nutrient canal divides into two branches, which make their way to the opposite ends of the bone, where they break up into a brushwork of minute vessels. When, after an injury, minute emboli of organisms, derived from some distant focus of infection, become impacted within this brushwork of vessels, acute osteomyelitis results. I take it very much the same thing happens where iritis supervenes upon a systemic infection.

The President, in his opening address, did not mention anything about quiet iritis. I refer to those cases in which the disease is not infrequently overlooked because the patient is not aware of any redness or acute pain in the eye, but he gradually becomes conscious of failing vision, and so sees an ophthalmologist. On dilatation of the pupil it is perhaps found that synechiæ are present. I have wondered whether there is some very low form of infection in these cases, and whether the President has had experience of such cases in which he could demonstrate some low form of infection, perhaps less acute than in cases of iritis of ordinary severity. I have seen two cases of gradual optic atrophy for which I made vaccines; I do not know whether this has any bearing on the subject. The patients were suffering from advanced pyorrhœa, and there was unilateral optic atrophy in each case. The ophthalmic surgeon thought the gradual optic atrophy was due to the condition of the mouth. The teeth were extracted, and I made a vaccine from cultures taken from the roots of the teeth. In both cases the surgeon was able to report that the process had subsided, and although the sight was not improved, the process was no longer advancing. I wondered whether something of the sort might apply to cases of quiet iritis, whether there might be a fairly chronic infection of low intensity as a cause in such cases.

After what we have heard to-night there can be little doubt that the majority of cases of iritis owe their origin to the presence of some focus of infection in the body. This has been impressed upon clinicians by continued observation, and further, when the focus of infection is removed the eye improves. And it may be added that further evidence is forthcoming from animal inoculations. One observer inoculated twenty-two rabbits with *Bacillus pyocyaneus* intravenously, and afterwards irritated the cornea. In five he produced definite iritis, from which he was able to recover the infecting organism. Similar experiments have been carried out with streptococci.

Mr. LESLIE PATON.

We owe to our President the recognition of pyorrhæa as a very potent source of iritis. Possibly it is in his honour that speakers to-night have laid a disproportionate stress on it as the most important cause. At the risk of increasing that disproportion, I will speak of a case in which a fairly direct connexion could be proved between a tooth-abscess and an attack of iritis. It was a case of very deep-seated keratitis profunda at first, associated later with considerable iritis.

When it came under my observation, there was a condition of onyx, considerable iritis with adhesions, and some hypopyon. The only source of infection found was a septic tooth. I operated upon this case, and got Captain Douglas to be present with me when the operation was done. We carefully sterilized the surface of the eye, and incised the onyx, from which he made cultures. Again sterilizing the eye, we removed some pus from the anterior chamber, from which he also made cultures. In both these cases he obtained a mixed infection of *Staphylococcus aureus* and *Micrococcus tetragenus.* The last-mentioned organism is practically only found in foul abscesses about the teeth, nasopharynx or lungs, and I think its presence in the hypopyon pus is as direct evidence as you are likely to get in a human being of the connexion between pyorrhœa and iritis.

The PRESIDENT (in reply).

I agree with all Sir Anderson Critchett's remarks as to treatment. I have learned a great deal from Mr. Turner's instructive speech, and if we follow his advice in treating patients, and tell them how to take care of themselves, we shall avoid many attacks of iritis, as well as many other diseases which come under the consideration of other Sections of our Society. There is no single part of the eye which is not influenced by sepsis. One thing upon which Mr. Turner did not lay stress is the importance of X-ray examination of the mouth in all cases in which there is doubt as to the existence of tooth infection. Some of the causes of obscure origin of iritis exist in the apices of teeth where the gums and the necks of the teeth appear to be normal, but a skiagram shows that the roots are anything but healthy.

Dr. Lyon Smith's information is most valuable: it will be a great help if by blood tests one can discover the cause of some of these obscure cases of iritis.

I also agree with Mr. Ernest Clarke's statement that it is important to correct any error of refraction. But I think it is still more important to try to eliminate any sources of sepsis; there is a natural tendency for all these cases to recover and then to relapse, and such tendency to relapse is materially helped by eye-strain. If, however, the source of infection can be removed, eye-strain does not matter at all, it cannot produce a relapse.

With regard to Dr. Lakin's remarks about "quiet" iritis, I am sure he is right in his surmise that there is some special micro-organism associated with that variety of iritis. We are still in the Dark Ages as to the causes of an enormous number of cases of iritis. I do not doubt, however, that when we can devote more time to research work, we shall be able to recognize, by the clinical appearance of the disease, the site of infection, and shall be able to say, in a case of quiet iritis, that one must look for a certain microbe in certain places, just as in gonorrhœal iritis or in a syphilitic case when one sees a gumma on the iris there is no need to ask questions.

It is interesting to hear Mr. Paton's report of the recovery of a micro-organism from the interior of an eye. If we could get a few more such cases, we should be helped a great deal in solving the mystery.

PATHOLOGICAL LABORATORY, UNIVERSITY, MANCHESTER.

Section of Otology.

President—Captain H. J. MARRIAGE, R.A.M.C.

(*November* 17, 1916.)

Case of Chronic Adhesive Otitis: Myringotomy and Partial Ossiculectomy.

By P. WATSON-WILLIAMS, M.D.

MISS S. E., aged 26, came under observation in May, 1916, with deafness of several years' duration. Membrana dry, slightly opaque and thickened, only slight retraction, with dry adhesive catarrhal otitis. Rinne negative. She had been treated in 1914 by another aurist, who repeatedly inflated the middle ear during four months, and ordered a nasal douche for post-nasal catarrh.

When I saw her first she could hear whispered words uttered as loudly as possible (H.W.W.), right 28 in., left 20 in.; after Eustachian catheterization (H.W.W.) right 54 in., left 36 in.

The maxillary antra and sphenoidal sinuses were explored by my suction syringe method, and muco-pus was found in the left sphenoidal sinus, which was opened on June 14, and at the same time the tonsils were enucleated. Subsequently repeated catheterization improved the hearing to H.W.W., right 88 in., left 38 in.

On September 20, Gellé test proved positive; I was led to the conclusion that there was absence of stapedio-vestibular ankylosis, and crucial myringotomy was therefore performed under nitrous oxide gas anæsthesia, with a view to determine how far direct exposure of the oval window to sound waves would improve hearing. Immediately after recovering from the gas anæsthesia the patient's H.W.W. was 7½ ft. (left). Apparently the middle ear was free from discharge, though naturally the bleeding prevented any careful inspection. Subsequently the patient developed a purulent otitis media, although every precaution had been observed with a view to rendering the auditory meatus aseptic. When this had subsided, the patient's H.W.W. was right 6 ft., left 24 ft. On October 17 the left membrana was more freely excised, and the lower half of the handle of the malleus removed, with the intention of making the perforation of the membrana permanent. The beneficial effect of the simple myringotomy has been maintained, and now after further catheterization of the right Eustachian tube the H.W.W. is right 6 ft., left 24 ft. In other words, the so-called good ear is relatively the deaf ear, whereas the previously deafer ear has very useful hearing. Time will show whether the improvement, which is remarkable, will be permanent. The patient is submitted in the present stage with a view to opinion as to the desirability of deferring any similar measure on the right ear. It is suggested that the chronic dry adhesive catarrh of the middle ear on both sides was a latent infective process, without polynuclears, and probably due to the sinus infection. When the drum was incised, it was thought that the traumatism converted the latent into an active inflammatory infection, and it soon subsided under appropriate treatment.

It is open to any one to say that the otitis purulenta was due to defective precautions having been taken in the way of prior disinfection, and in regard to instrumentation; but I took the usual precautions, and I do not think that was the explanation. I think it illustrates the point which has been emphasized by Mr. Fraser—namely, the possibility of a dry adhesive catarrh being a latent infection, which may pass on to a labyrinthine process resulting in otosclerosis. Another point I suggest is the desirability of investigating the condition of the nasal sinuses, especially the sphenoidal, in cases associated with infection in the middle ear. In all my mastoid cases I investigate the condition of the maxillary antrum and sphenoidal sinus, and I think some of our disappointing cases are due to infection of those sinuses.

DISCUSSION.

The PRESIDENT: I should like later on to hear from Dr. Watson-Williams whether this patient's hearing remains good, or whether the present improvement was only temporary. I make this request because I have found so often in the treatment of these cases of chronic dry catarrh by operation, such as the removal of the drum and skin grafting, &c., that though the hearing improved for a time, afterwards sclerosis occurred, and the deafness became as marked as before.

Sir **William Milligan**: Dr. Watson-Williams is to be congratulated—at the moment at any rate—on a very excellent result; but we know these cases are apt to relapse. Many years ago I tried treatment more or less on the lines he followed in this case, but gave it up in disgust, because, although improvement took place and lasted a few months, I do not think I could name a case in which it persisted for over a year. Dr. Watson-Williams may still see the re-formation of a cicatricial membrane. It is true that amputation of a portion of the handle of the malleus militates against this, but, even so, I doubt if there will be permanent improvement. With regard to his explanation as to how the middle ear became infected, I regard it as far-fetched. No one can be quite certain of rendering the external meatus aseptic, and any one may have sepsis after such an operation—though I am sure Dr. Watson-Williams took all ordinary precautions. I do not think his conclusion that the middle ear was the seat of a latent infection is legitimate, because, according to Dr. Watson-Williams's own statement, when he opened the middle ear it was quite dry. [Dr. **Watson-Williams**: It appeared dry.] At any rate, there was no secretion, and no exudate visible. The patient had had sphenoidal sinusitis on that side, and post-nasal catarrh—perhaps the result of the former—so we have not far to look for the source of infection. There may have been infection of the Eustachian tube, and with manipulation the middle ear became infected *per tubam*. I used to think that part of the want of hearing in these "dry" ears was due to the lack of lubrication of the vesicular chain. The case is, however, a good example of at least the temporary value of myringotomy.

Mr. **Herbert Tilley**: Most of us remember the great boom, some twenty years ago, of this method of operating for chronic adhesive catarrh of the middle ear. Papers recording their experience were written by Dr. Burnett and Dr. Sexton, of New York, special instruments were devised by them, and many ossiculectomies were carried out as a result of their former experiences. I performed the operation on a number of hospital patients, and on a fewer number in private practice, having clearly explained to each of them that without treatment there was practically no cure, but that this operative method was stated to give great relief. I was allowed to try it on the bad ear, the feeling being that it could not make the hearing of that ear worse, and it might make it better. For a time, and in a few cases, there was gratifying improvement, but I did not have a single case in which it was permanent. For the last eighteen years I have abstained from operating for this type of deafness. I agree with Sir William Milligan as to the probable mode of infection of the ear in this case, but I do so from another point of view. I do not think anyone who has been interested in suppurative lesions of the nasal accessory sinuses can help being struck by the rarity of suppuration in the ears of these patients, even though the chances of infection are so manifold. If you take 100 cases of chronic suppurative otorrhœa, in only about five, if you search the sinuses, will you find suppurative lesions in them. I have published one striking case in which I unwittingly cured a patient's chronic suppurative otorrhœa by operating on his right maxillary antrum. He said the discharge in his ear had stopped, though it had continued for years. That is one of the few cases in which I remember there appeared to be any connexion between the two lesions. I do not know why the ear should withstand infection in these suppurative nasal cases, unless it is due to auto-immunization.

Dr. W. HILL: It is extraordinary how many men have taken up this method and then dropped it. Toynbee gave it up, not only because he obtained no great results, but because somebody got meningitis in a case from infection. Some of the ears in these cases will suppurate after puncture, whatever precautions you take: one need not go to the nasal cavities for reasons for this. When I first worked at otology I looked up the subject, and I had a communication from Professor Politzer. When I saw him, and asked him about it, he said, "I have done it, but it is not a bit of good." Berthold, Schwartze and Halle described improvements, and again in America the subject was taken up, as has been stated. Eighteen years ago, Dench, of America, published a large number of cases, and I think that in his book it will be seen that he recommends it now. But every one else whose opinion one values considers that the game is not worth the candle. The patients upon whom I have operated in two or three cases of the kind during the last ten years have been doctors' wives; probably their husbands had read up the subject and they were prepared to take the risk. I was very much gratified on one occasion by getting a result similar to that obtained by Dr. Watson-Williams, for directly the patient came from under the influence of the gas she exclaimed that she could hear, and expressed her great delight. This lasted for two days, and the good result was due to the blood having acted as an artificial tympanum. Then I tried glycerine, which seemed to act better, but later there was a relapse. Then the husband asked me to remove part of the drum membrane, with the malleus and the incus, which I did, and we used glycerine and wool as an artificial membrane. But the whole thing went back after a few months, and I think the last stage was worse than the first. There were many adhesions and impaction of the foot-plate of the stapes. In two or three cases the preliminary myringotomy improved the hearing very considerably indeed, but, on the whole, I have had no encouragement to go on with it. One operator, Faulder White, has written on this operation, and, I think, practises it at the present day, but I do not think he has any great following. I shall be glad should we find we can revise our judgment and our conclusions on this special subject, but I fear we shall be doomed to disappointment.

Dr. DUNDAS GRANT: I am afraid we do not know the conditions which lead some perforations to remain open when we want them to close, and others to close when we want them to remain open. As a rule, when a perforation persists, it is because the vitality of the patient, or that of the tympanic structures is lowered, as happens in tuberculosis, scarlet fever, &c. It is difficult to say whether the fact of suppuration having occurred in Dr. Watson-

Williams's brilliant case favoured the persistence of the opening, but perhaps that furnishes an indication of means of keeping perforations open. With regard to the reason why the infection should have occurred, if we regard it from the physical standpoint, we see that the mechanical conditions are entirely changed in the tympanic cavity when one opens the tympanic membrane: the pressure is different from what it is when the membrane is whole. Thus, when we force air up through the tube in blowing the nose, we are certain to produce increased compression of air in the tympanic cavity, without solid particles necessarily finding their way up. But when an opening is made in the tympanic membrane, actual material, or at all events microbic contents from the naso-pharynx will be driven up. In the same way the tympanic cavity will often drain much better through the Eustachian tube when a perforation has been made in the membrane, just as when a pipette already full is to be emptied, one has only to remove one's finger from the orifice for the fluid to run out. In this way it is easy for infection to have occurred here, even though Dr. Watson-Williams's asepsis in the meatus may have been perfect. A writer in the *Monatsschrift für Ohrenheilkunde*, professed to keep perforations open by repeatedly injecting liquid vaseline up the Eustachian tube, until it ran out through the perforation. I tried it, and I think it kept a perforation open for some time, but I could not maintain the treatment long enough to judge of its permanency. I congratulate Dr. Watson-Williams on his good result, so far.

Dr. URBAN PRITCHARD: May I go further back in the history of this matter, and remind you that Sir Astley Cooper began this operation for deafness? He happened to perforate a membrane, and got this result. Then it healed up, and, of course, he had done no good. He had so many patients rushing to consult him after that case, that at last he refused to see any deaf patients at all. I am a pessimist as regards this operation. I have seen so many measures tried that I do not think we shall ever arrive at anything like permanent success. This excellent case of Dr. Watson-Williams' is a little spoilt because of the suppuration. If you get suppuration, and thereby permanence, you may get some lasting good. But there are all the dangers of suppuration. I think that in six months' time this case will be *in statu quo*.

Mr. SYDNEY SCOTT: I would even go a step further than Professor Urban Pritchard, and warn aspiring performers of this operation that the *ultimate* effect on hearing may be that the hearing becomes worse than it was previous to the operation, in spite of marked temporary improvement. Dr. Watson-Williams has wisely borne this possibility in mind by operating on a patient with *unilateral* deafness. Deplorable consequences were known to have followed this procedure when applied to both sides. I think we should like to know what the condition is, say, this time next year.

Dr. P. WATSON-WILLIAMS (in reply): I wish to thank members for the interest they have shown and the remarks they have made. I feel with them the need for great caution in accepting results until time has shown what the ultimate effect may be. This patient improved before there was any time for suppuration to influence the result: the improvement was so immediate that it could not have been due to suppuration; still, subsequent further improvement might be due to the suppurative process. With regard to Mr. Tilley's point, that he has seen many cases without infection of the ear, I would say that there are a good many cases of otitis media, especially the suppurative form, in which, if investigated, we should find the sinuses infected. I have had cases of acute mastoiditis in which cure resulted from operating on the sinuses, the ear being left alone. When the chief trouble is in the ear itself, our attention is not often enough drawn to the sinuses. I agree with Mr. Scott's point, though in this patient it is hardly a moot question as to whether the patient will be worse for the operative procedure, than if one had left her alone. I chose the worse ear for operation first, and I told the patient and her parents that I could not guarantee anything at all, and that they must be prepared to take it for what it was worth. In spite of the gratification of the patient, I have refused to operate on the other ear until time has shown that the result in the ear operated upon is completely satisfactory. I shall be glad to bring the result before the Section after the lapse of further time. I have no note of any tinnitus before the operation, and I do not think there is any now.

(*November* 17, 1916.)

A Further Case of Otosclerosis associated with Otitis Media.

By J. S. Fraser, M.B., F.R.C.S.Ed.

At the meeting of this Section in May I showed a case of otosclerosis associated with chronic purulent otitis media and cholesteatoma. You may remember that the microscopic examination was rather incomplete because the region of the oval and round windows had been destroyed by a saw cut. I now wish to demonstrate another case in which I have a complete series of microscopic preparations from both ears.

The patient was a woman who died on January 4, 1916, at the age of 63. She was married in 1881 and her husband tells me that she was very deaf at this time. The patient attributed her deafness to an attack of scarlet fever in childhood. Both she and her brother had scarlet fever and otorrhœa at the same time. Her brother recovered his hearing, but the patient gradually became deaf. Her husband informs me that she always had a purulent discharge from the left ear and complained of severe tinnitus like the roaring of the sea. The noises also had at times a "beating" character. She sometimes complained of dizziness. As far as her husband knows there was no deafness in the patient's family. I have been unable to obtain definite information with regard to the presence of paracusis, but her husband thinks that she did hear better in a noise. The patient visited the Royal Infirmary about fifteen years ago, and also attended the Eye and Ear Hospital, Cambridge Street, Edinburgh, and had the Eustachian catheter passed. So far I have not been able to obtain any report regarding the functional examination of the ear. Except for attacks of eczema the patient appears to have enjoyed good health. The husband tells me that the patient had one child before marriage and that after marriage there was one miscarriage. For three years before her death she was an inmate of the Poorhouse at Craiglockhart, to which she was admitted on March 26, 1913. She suffered from gangrene of the left foot for a short time before death: the temperature was raised for the last fourteen days. Post-mortem examination revealed cerebral softening.

Microscopical Examination of Right Ear.

(1) The right external meatus is normal, but the drumhead is slightly thickened in the posterior part—possibly the result of former otitis media.

(2) *Middle Ear.*—The tubal part of the tympanic cavity appears to be wide. The mucous membrane of the tympanic cavity appears normal, except in the region of the oval window where the submucosa is thickened, congested and œdematous. The round window is healthy and the malleus and incus are normal. The stapes is ankylosed by bone to the anterior margin of the oval window. In the roof of the tympanic cavity the marrow spaces are congested and, where they lie next to the Eustachian tube, they show leucoblastic reaction or fibrous tissue. The tympanic muscles appear to be healthy.

(3) *Labyrinth Capsule.*—Above the level of the oval window there is an area of osteoporosis or ostitis vasculosa. Engorged vessels are seen entering this area from the deep layer of the swollen tympanic mucosa. The ostitis vasculosa shows a tendency to extend forward into the cochlear capsule between the cartilage and lamellar bone.

(4) *Labyrinth Contents.*—(*a*) Cochlea: Corti's organ is fairly well formed in the middle and upper coils, but the hair cells are not recognizable. In the lower coil the auditory papilla is not so well formed, but this is not unusual. There appears to be some shrinkage of the cells of the spiral ganglion, especially in the basal coil, and slight small cell infiltration of the ganglion, but these changes are too slight and indefinite to have stress laid upon them. (*b*) Vestibule: The

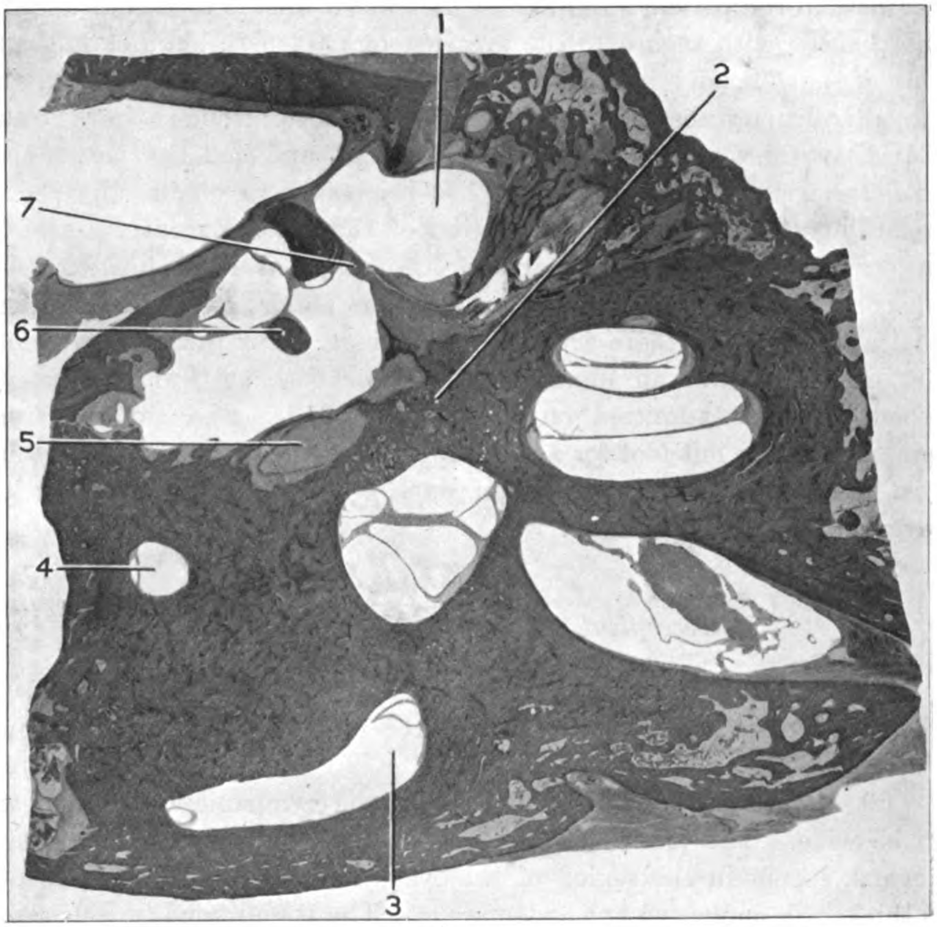

FIG. 1.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through right ear. No. 180. 1, anterior or tubal portion of tympanum; 2, area of ostitis vasculosa (otosclerosis) just above level of oval window; 3, crus commune; 4, lateral canal; 5, facial nerve; 6, incus; 7, tendon of tensor tympani attached to malleus. (× 6.)

otolith membrane of the utricle is separated from the neuro-epithelium, but otherwise the vestibular structures appear to be healthy. The lining membrane of the saccus endo-lymphaticus shows a peculiar appearance—the connective tissue beneath the epithelium lining being thrown into polypoid folds. (*c*) Canals: The cristæ of the canals are not so prominent as usual, but otherwise there is nothing to note.

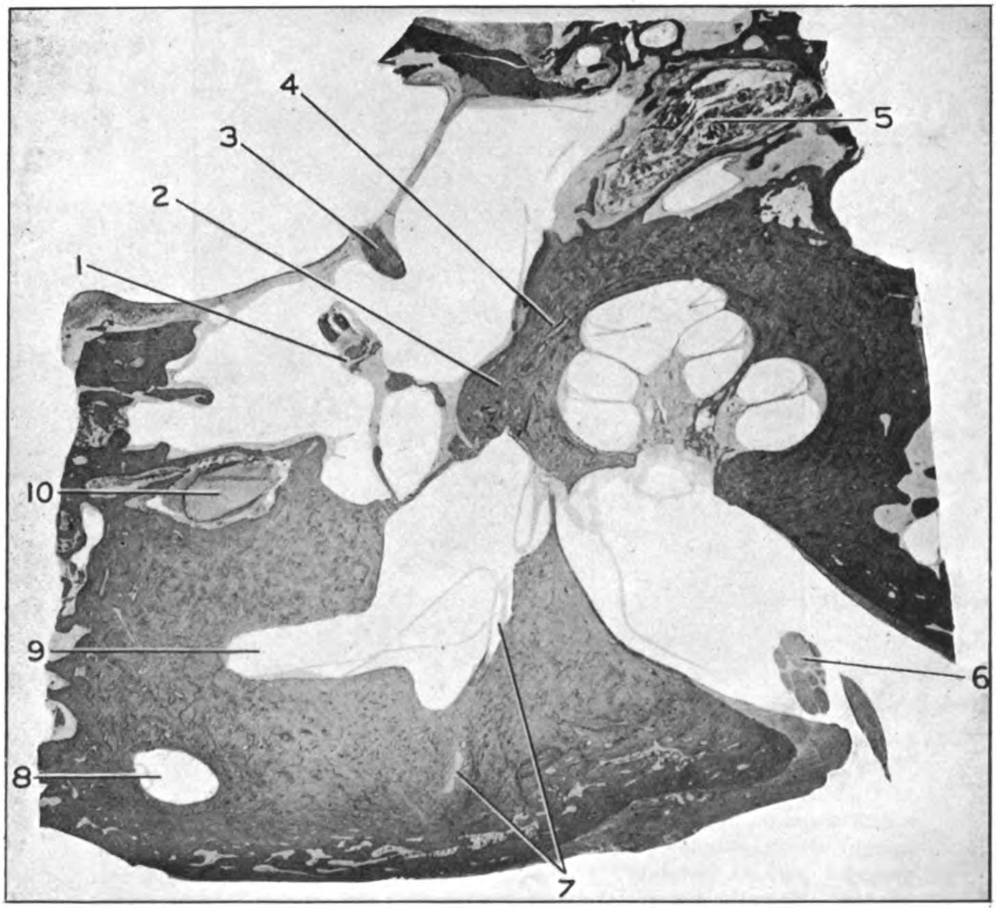

FIG. 2.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through right ear in region of oval window. No. 250. 1, joint between incus and stapes; 2, area of ostitis vasculosa in anterior margin of oval window; 3, Handle of malleus; 4 ostitis vasculosa spreads in cochlear capsule between cartilage and lamellar bones; 5, tensor tympani; 6, facial nerve: the eighth nerve is absent (artefact); 7, two parts of endolymphatic duct; 8, posterior canal; 9, smooth end of lateral canal joins vestibule; 10, facial nerve. (× 6.)

(5) *Internal Meatus.*—The eighth nerve has unfortunately been torn out in the removal of the specimen. The seventh nerve appears to be normal.

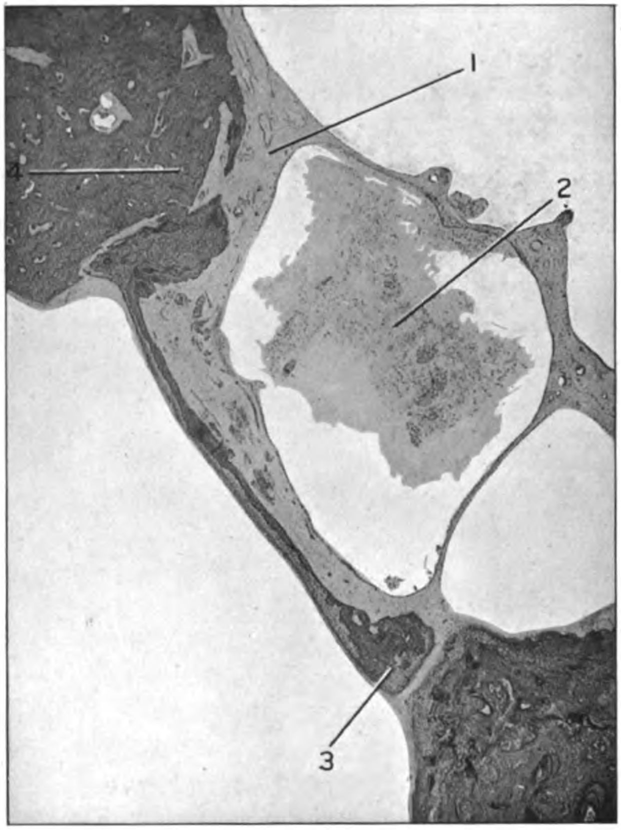

FIG. 3.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through right ear. No. 220. 1, thickened mucosa of anterior margin of oval window; 2, mucopurulent exudate in hollow of stapes; 3, posterior part of footplate; 4, region of ankylosis between stapes and oval window. Note the inflammatory process invading the anterior bony margin of the oval window from the deep layer of the swollen mucosa. (× 25.)

Summary.

There are slight evidences of an inflammatory change in the marrow spaces in the roof of the Eustachian tube and also in the mucosa lining the niche of the oval window. Elsewhere the middle ear structures are normal. The stapes is ankylosed to the anterior margin of the oval window, and the bone in this region shows marked osteoporosis which extends forward for a slight distance into the capsule of the cochlea. Considering the age of the patient, the nerve structures of the inner ear may be considered to be practically normal.

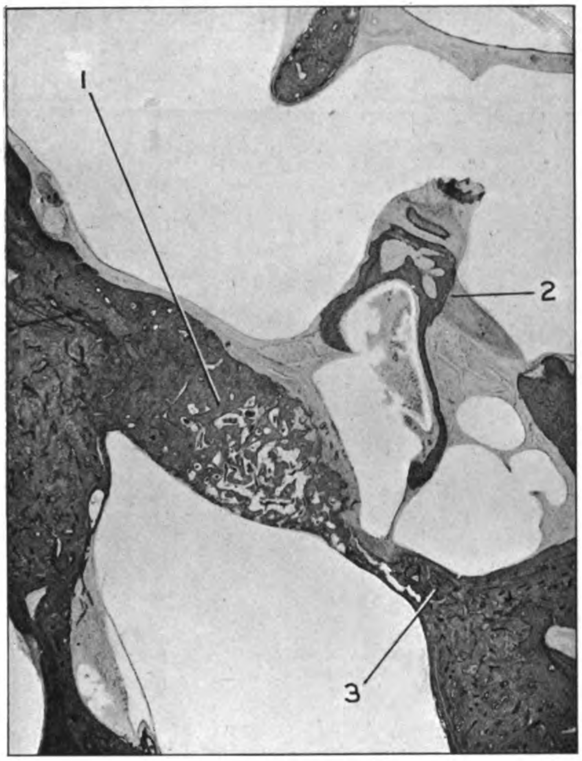

FIG. 4.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through right ear. No. 265. 1, area of ostitis vasculosa in anterior and lower margin of oval window; 2, tendon of stapedius attached to head of stapes; 3, split in bone of posterior margin of window (artefact). (× 12.)

Microscopic Examination of Left Ear.

(1) *External Meatus.*—The sub-epithelial tissue in the roof of the meatus is swollen and the epithelium itself desquamating. *Drumhead:* The tympanic membrane is very thick in its upper part and is bound to the inner wall of the drum cavity by adhesions. The lower part of the membrane is perforated: at the edges of the perforation the epithelium is absent. There is marked small cell infiltration of the

subepithelial tissue at the edges of the perforation. There is no extension of squamous epithelium from the outer surface of the drumhead round the edges of the perforation into the tympanic cavity.

(2) *Middle Ear Cleft.*—(*a*) Eustachian tube: The mucous membrane of the Eustachian tube is swollen and the submucosa infiltrated with small cells. A little pus is present in the tubal part of the tympanic cavity. The epithelium of the tube is clearly desquamated.

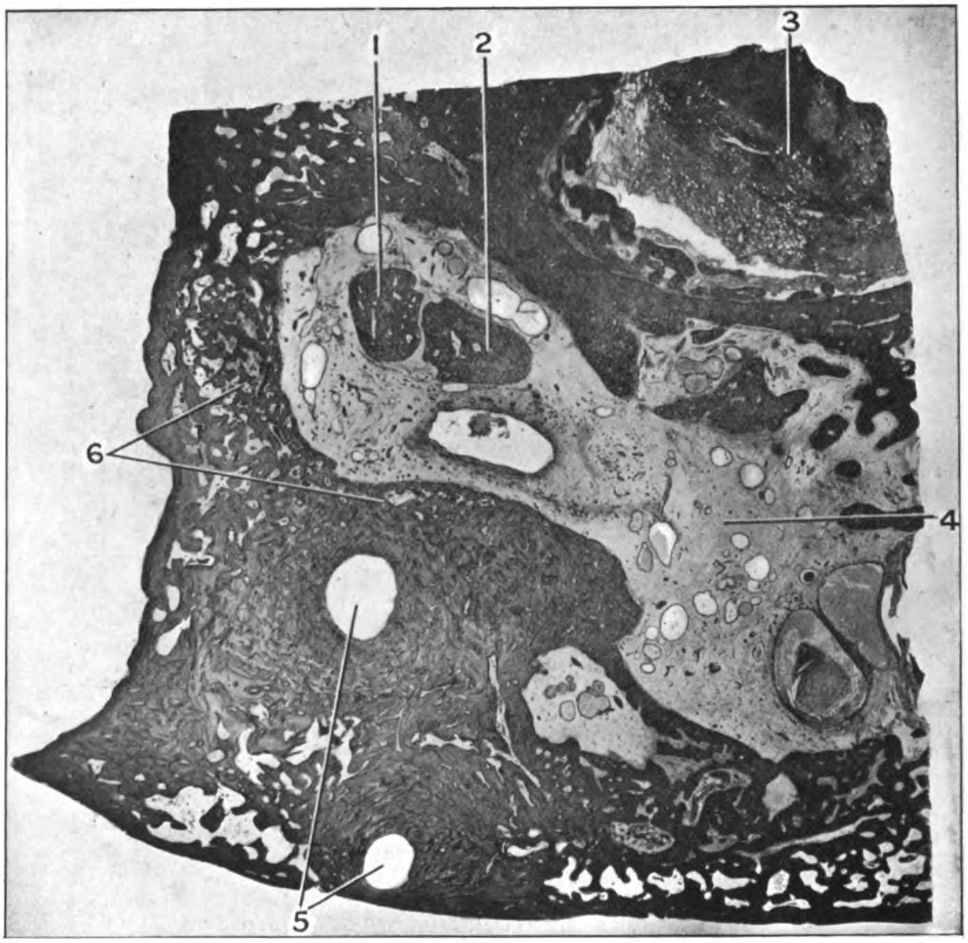

FIG. 5.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through left ear in region of tympanic attic. No. 40. 1, malleus; 2, incus; 3, swollen lining membrane of external auditory meatus; 4, antrum filled up by swelling of submucous tissue; 5, two ends of the superior vertical canal; 6, areas of ostitis vasculosa in walls of attic due to inflammatory invasion of the bone from the submucous tissue. (× 6.)

(*b*) Tympanic cavity: There is great swelling of the mucosa of the attic, the submucosa being converted into granulation tissue. Cystic spaces containing pus are present in the attic and represent the remains of the attic cavity. The walls of these spaces show marked small cell infiltration. In the parts more remote from the attic cavity the bony walls show the usual fatty marrow, while nearer to the attic the marrow is more cellular and next to the submucosa the marrow spaces contain

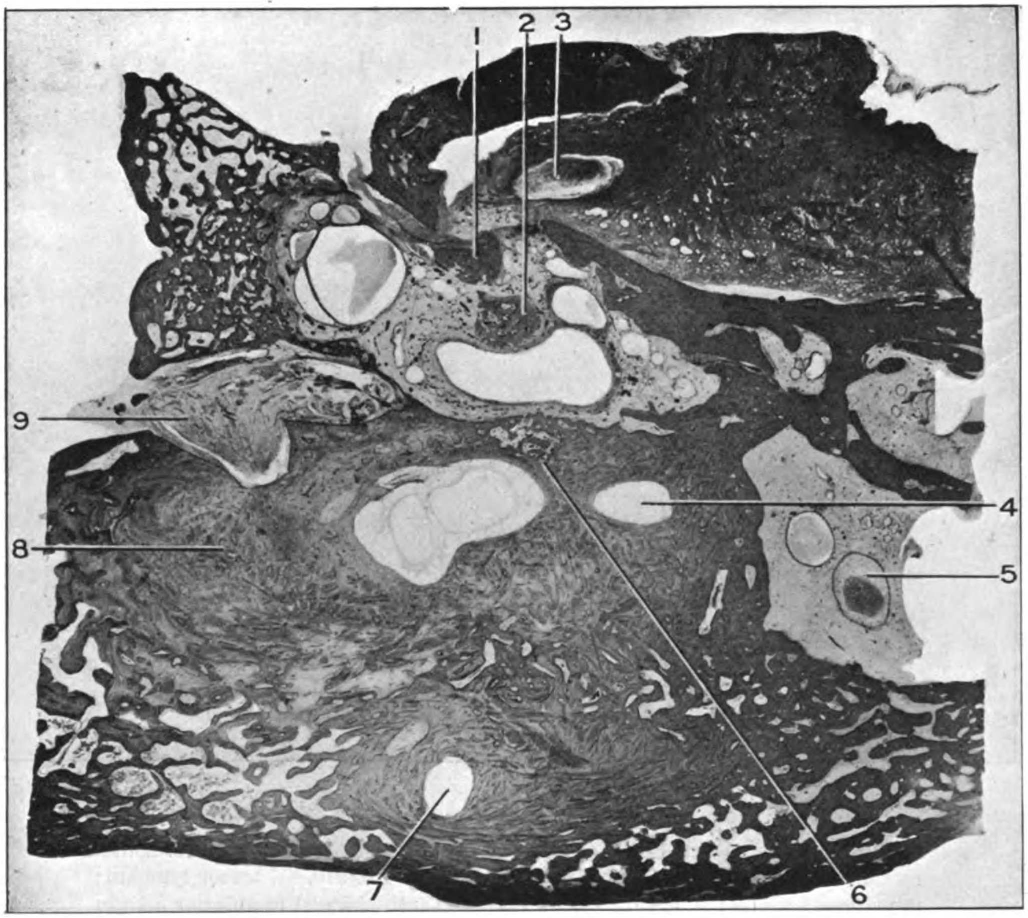

FIG. 6.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through left ear above level of oval window. No. 105. 1, malleus (eroded); 2, incus (markedly eroded); 3, desquamated epithelium in external meatus; 4, lateral canal; 5, cystic space in antrum filled with mucoid material; 6, area of ostitis vasculosa just above oval window; 7, smooth end of superior canal; 8, capsule of cochlea; 9, geniculate ganglion of facial nerve. (× 6.)

granulation tissue. The bony walls of the attic cavity show marked osteoporosis and stain deeply with basic stains. The mucous membrane in the niche of the oval window is thickened, congested and infiltrated. The round window niche shows swelling of the submucosa with some cystic spaces and adhesions but no areas of osteoporosis. Ossicles: The malleus is almost normal. The long process of the incus is plainly eroded and in parts almost resolved into granulation tissue.

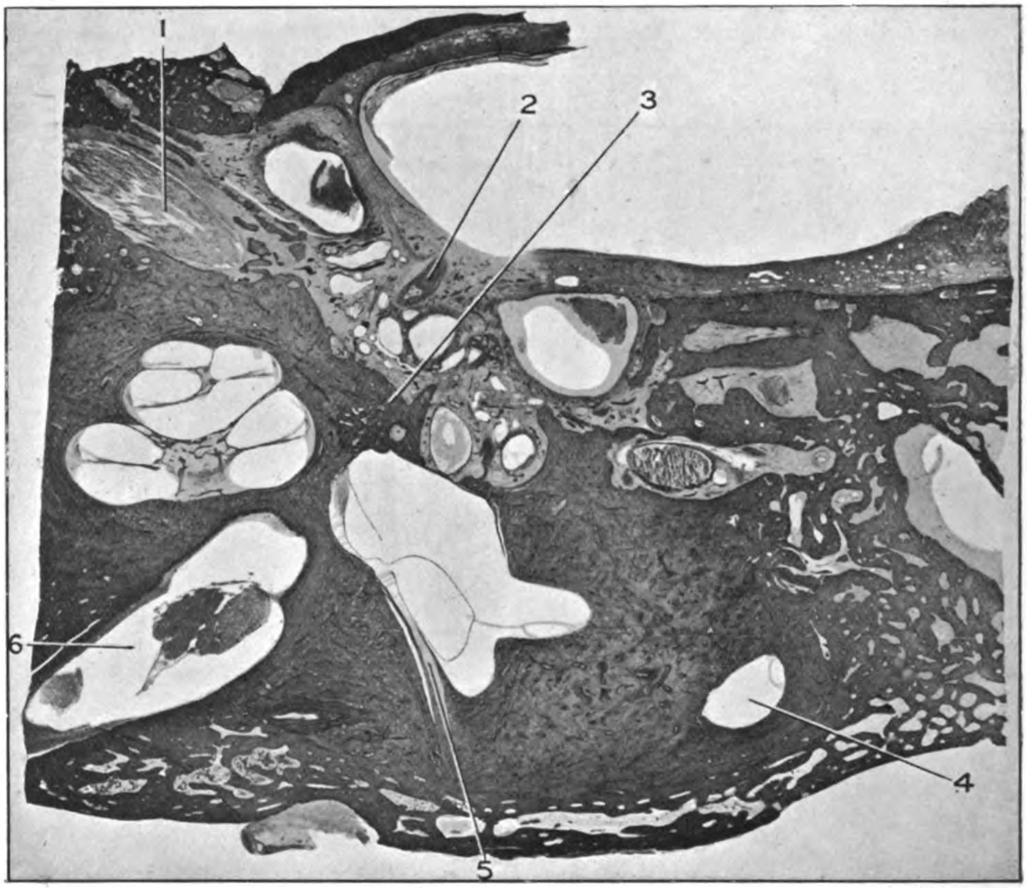

FIG. 7.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through left ear in region of oval window. No. 210. 1, tensor tympani; 2, malleus handles; 3, area of ostitis vasculosa (otosclerosis) in anterior margin of oval window, with anterior part of stapes ankylosed to it; 4, posterior canal; 5, endolymphatic duct; 6, internal meatus. Note the marked adhesive process in the tympanic cavity. (× 6.)

There is marked ankyloses of the stapes to the anterior margin of the oval window. The foot-plate itself is greatly thickened. The posterior part of the foot-plate is not ankylosed, but is jammed tight against the posterior margin of the oval window. Tympanic muscles: The tensor tympani appears to be rather more fatty than usual and the processus cochleariformis is eroded. The stapedius is healthy.

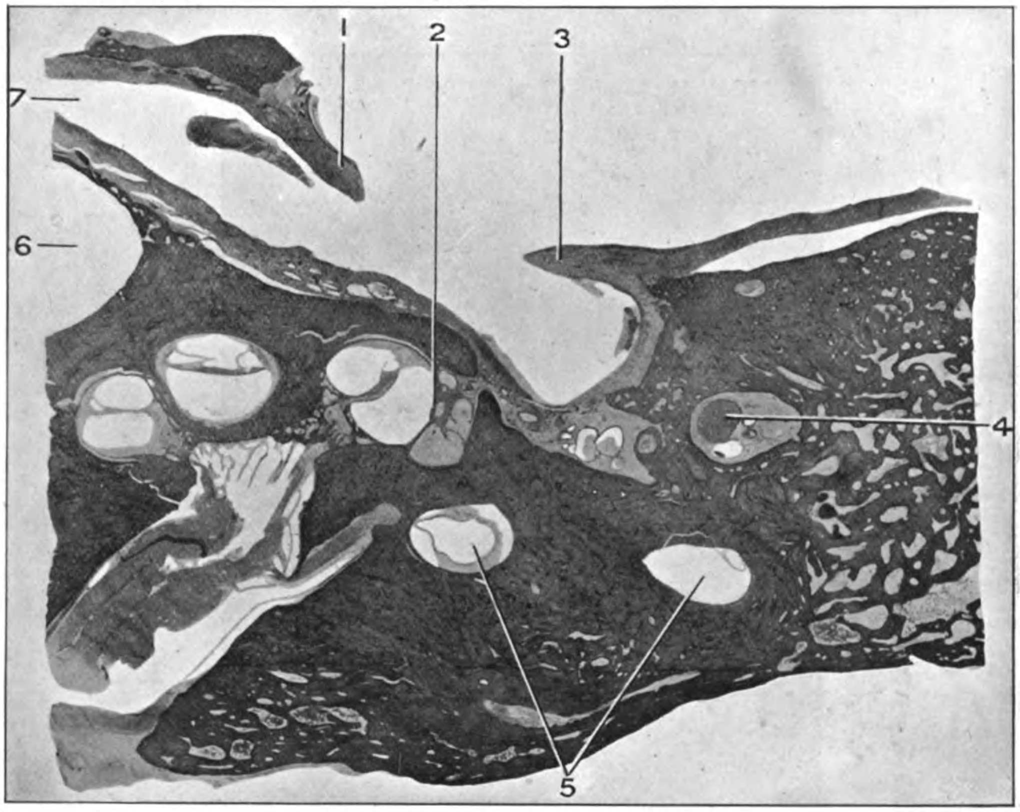

FIG. 8.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through left ear in region of round window. No. 265. 1, anterior margin of perforation in drumhead; 2, membrane of round window; 3, posterior margin of perforation; 4, facial nerve; 5, two ends of posterior canal; 6, carotid canal; 7, Eustachian tube. Note that niche of round window and sinus tympani are both filled up by swollen mucosa. (× 6.)

(3) *Labyrinth Capsule.*—There is an *area of ostitis vasculosa in the bony prominence of the lateral (external) canal* as it lies on the inner wall of the auditus. The inflammatory change can be seen to pass in

from the congested and swollen muco-periosteum on the inner wall of the middle ear. There is a second area of ostitis vasculosa or osteoporosis in the anterior margin of the oval window, where the promontory is much affected. Below the level of the oval window ostitis vasculosa is still present and bulges inwards encroaching on the cavity of the vestibule. There is a third area of ostitis vasculosa at the apex of the cochlea just below the point where the tendon of the tensor tympani is attached. (It has already been stated that the processus cochleariformis showed marked erosion of the bone.) Elsewhere the labyrinth capsule is healthy. The veins of the fossa subarcuata are dilated.

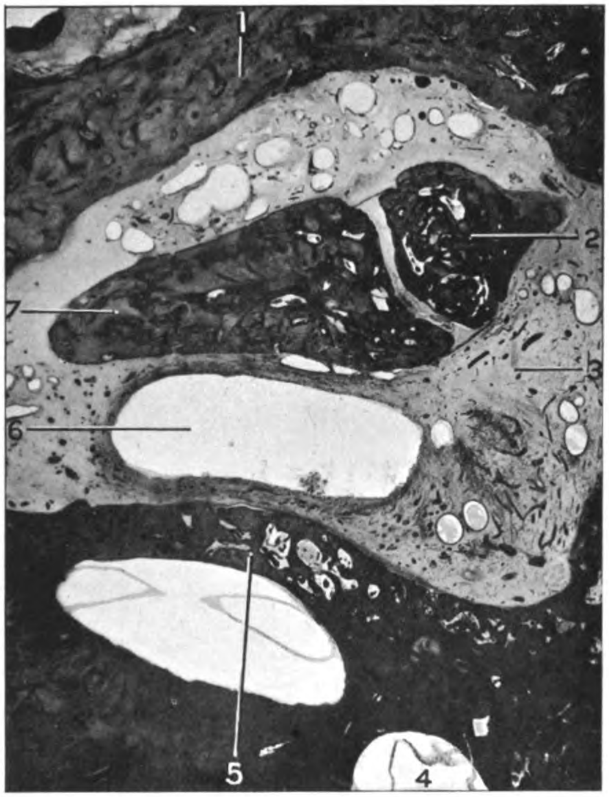

FIG. 9.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through left ear in region of attic. No. 65. 1, external wall of attic; 2, malleus; 3, swollen submucosa; 4, ampullary end of superior canal; 5, area of ostitis vasculosa in bony wall of lateral canal; 6, remains of attic cavity; 7, short process of incus. (× 12.)

(4) *Labyrinth Contents.*—(*a*) Cochlea: Corti's organ appears to be well formed in all coils though the hair cells cannot be distinguished. The ganglion cells are very little, if at all, shrunken. The perilymphatic aqueduct is patent at both ends and is normal throughout. (*b*) Vestibule: The saccule and utricle with the endolymphatic duct are normal. (*c*) Canals: As on the right side the cristæ of all three canals are very low and the cupulæ are absent.

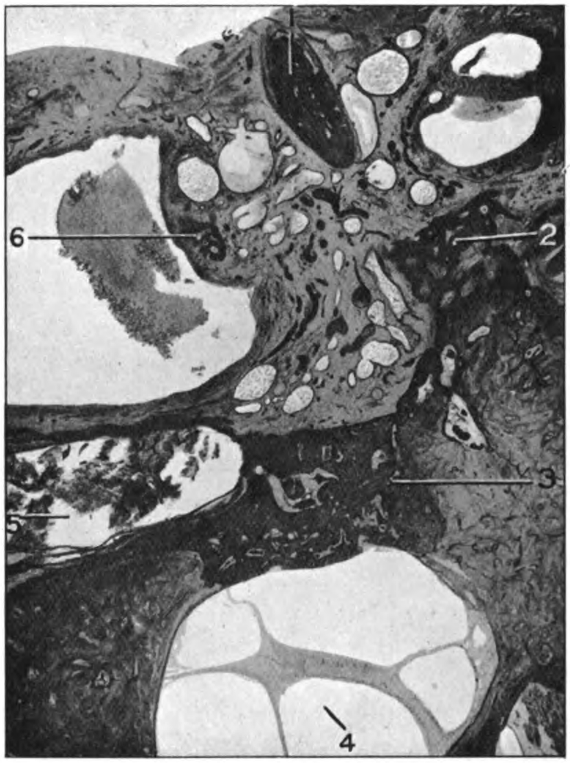

FIG. 10.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through left ear just above oval window. No. 175. 1, malleus, 2, processus cochleariformis; 3, area of otosclerosis; 4, utricle; 5, facial nerve in shreds (artefact); 6, eroded long process of incus. (× 12.)

(5) *Internal Meatus.*—There are a few small cells in the fundus of the meatus. The vestibular ganglion appears to be healthy and the two divisions of the eighth nerve are normal. The usual corpora amylacea are present in the eighth nerve at the junction of the central and peripheral parts.

Summary.

On the left side the changes in the middle ear and labyrinth capsule are much more pronounced. Otitis media (purulenta) is still present and the drumhead is perforated. There is a marked chronic adhesive process in the upper part of the tympanum, with great thickening of the submucosa and erosion of the long process of the incus. The stapes is ankylosed to the anterior margin of the oval window. There are three well marked areas of ostitis vasculosa in the labyrinth capsule on the inner wall of the middle ear: (*a*) in the lateral canal; (*b*) in the anterior margin of the oval window; (*c*) at the apex of the cochlea. The labyrinth contents are normal.

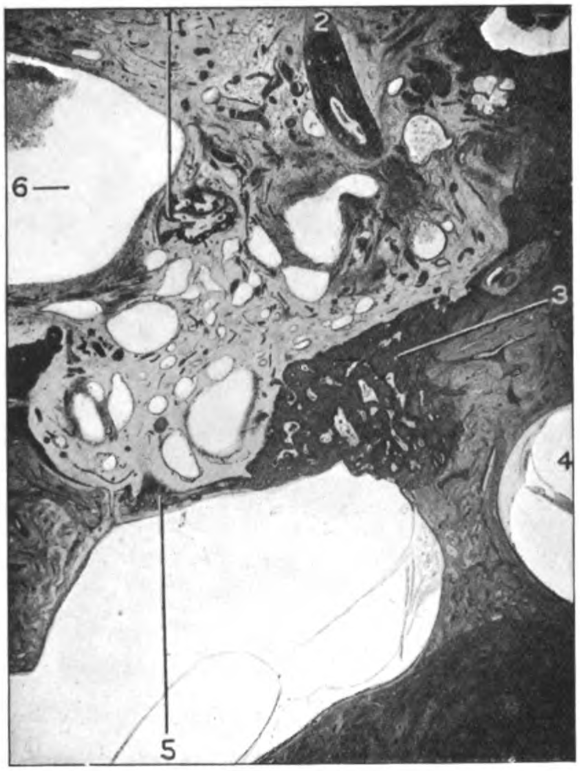

FIG. 11.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through left oval window. No. 205. 1, long process of incus, showing ostitis vasculosa; 2, malleus; 3, area of ostitis vasculosa in promontory ankylosed to 5, footplate of stapes; 4, cochlea; 6, tympanic cavity. (× 12.)

I hold that in this case the otosclerosis on both sides was secondary to otitis media. On the right side the otitis media passed off but left traces in the region of the tube and oval windows. In time the inflammatory process invaded the bone in the latter area and resulted in otosclerosis with fixation of the stapes. On the left side the otitis media continued and invaded the labyrinth capsule in three distinct areas as stated above.

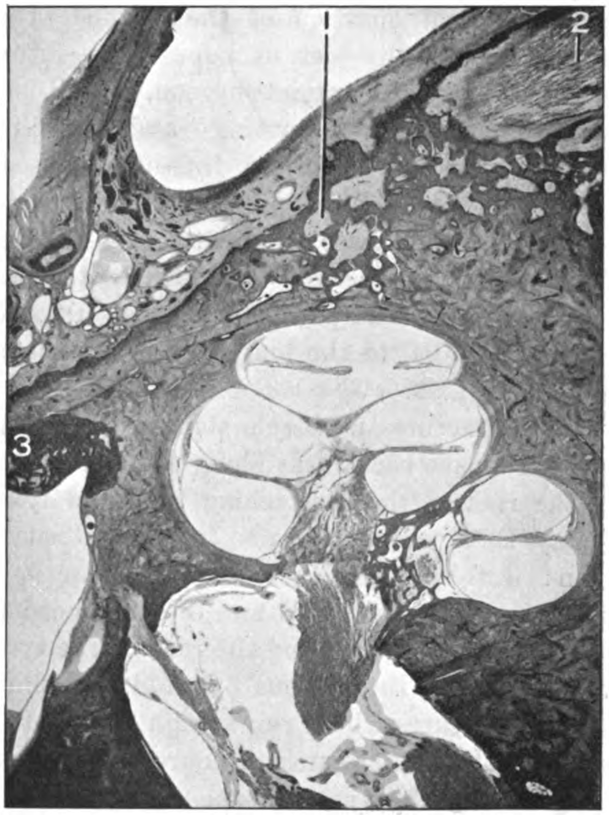

FIG. 12.

Otosclerosis associated with otitis media. A. W., female, aged 63. Horizontal section through left cochlea. No. 245. 1, area of ostitis vasculosa at apex of cochlea in region of processus cochleariformis; 2, tensor tympani; 3, area of otosclerosis below oval window. (× 10.)

(*November* 17, 1916.)

Injuries of the Middle and Inner Ear in Fracture of the Cranial Base.

By J. S. Fraser, M.B., F.R.C.S.Ed.

At the present time it is hardly within the province of the otologist to enter into the general question of the method of production of fractures of the base. In the—let us hope near—future, when the otologist has developed into the cranial surgeon, it will be advisable for him to deal with the subject of "bursting" and "bending" fractures, and to indicate the direction of these fractures caused by falls on various parts of the head. At the present time it need only be said that fractures of the cranial base frequently involve the middle and inner ear. Brun[1] finds that there is disturbance of hearing in 14 per cent. of skull injuries and in 24 per cent. of basal fractures. The line of fracture may run parallel to the long axis of the petrous bone or at right angles to the long axis.

(1) Longitudinal fractures as a rule start in the orbit or region of the sella turcica, and pass backwards along the line of the middle ear cleft, breaking the roof of the Eustachian tube and tympanic cavity. The fracture may then pass outwards to the external meatus and squamous region: if this is the case the inner ear is not involved, though the ossicles may be dislocated and the drumhead torn. On the other hand the fracture after reaching the roof of the tympanic cavity, may pass inwards through the petrous pyramid, and thus resemble in some respects those fractures which run at right angles to the long axis of the petrous bone. The inner ear is of course involved in these latter cases. (Case II belongs to this second type.)

(2) Genuine transverse fractures of the petrous pyramid run at right angles to the long axis of the pyramid, and always injure the labyrinth. As a rule the fracture passes through the external meatus, roof of the tympanic cavity, vestibule and internal auditory meatus, as this is the line of least resistance. The fracture may, however, pass further forward through the cochlea, or further back when the canals are involved.

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[1] Brun, H., "Der Schädelverletzte und seine Schicksale," *Beitr. z. Klin. Chir.*, 1903, xxxviii, pp. 192, 289, 601.

If the patient survives the injury at the time, he is not out of danger, as meningitis may supervene as the result of infection from the middle ear spaces, or of contamination of the blood in the external meatus and tympanic cavity. Such a complication is of course more likely if the labyrinth is involved in the fracture.

Stenger[1] has experimented on rats, in which he produced labyrinthine concussion by blows on the head. After the injury the rats seemed stunned and lifeless, but soon recovered. The animals were killed at various periods after the injury. In slight cases microscopical examination of the inner ear showed hæmorrhage confined to the region of the round window and lower coil of the cochlea. After more severe injury the whole of the cochlea showed blood extravasation and also hæmorrhages in the cochlear nerve.

From the point of view of microscopical anatomy, Nager[2] divides cases of labyrinth injury observed in the human subject, as the result of fracture of the base, into (1) recent and (2) old.

(1) The former cases are those in which the patient dies soon after the injury. In these Barnick[3] has shown that where the labyrinth capsule is injured, we have marked destruction of, and hæmorrhage into, the inner ear. Even in those cases in which the labyrinth capsule is not injured, we meet with hæmorrhage in the inner ear and eighth nerve. The auditory nerve may be ruptured (Lange[4] and Linck[5]) and the crura of the stapes torn from the footplate.

(2) With regard to the old cases, it appears that up to 1909 at any rate—the date of publication of Nager's paper—only two cases had been microscopically examined: (*a*) Manasse's[6] patient had suffered from fracture of the skull fifteen years before death, and yet on microscopic examination the line of fracture was still clearly visible—partly closed by fibrous tissue and partly by new bone. The break traversed the stapes and vestibule as in Case II recorded below. Manasse found new connective tissue and bone in the vestibule and in the basal coil of the cochlea. The scala media was dilated and the sensory cells and nerves were atrophied. (*b*) Nager[7] himself has examined the ear of an old deaf mute whose loss of hearing was due to an injury of the skull sixty years before death. In this case the line of fracture was not

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[1] Stenger, *Archiv f. Ohrenheilk.*, 1909, lxxix, p. 43.

[2] Nager, *Med. Klin.*, 1909, v, p. 1525.

[3] Barnick, *Archiv f. Ohrenheilk.*, 1897, xliii, p. 23.

[4] Lange, *Zeitschr. f. Ohrenheilk.*, 1907, liii, p. 37.

[5] Linck, *Zeitschr. f. Ohrenheilk.*, 1909, lvii, p. 7.

[6] Manasse, *Virchow's Archiv*, 1907, clxxxix, p. 188.

[7] Nager, *Zeitschr. f. Ohrenheilk.*, 1907, liv, p. 217.

evident. The canals were obliterated by new bone, and the vestibule and basal coil of the cochlea filled up to a great extent by the same substance.

CASE I.

The first case I wish to show is that of J. P., a male, aged 54, who was admitted to the wards of Mr. Charles (now Colonel) Cathcart, at 2 p.m. on December 6, 1910. I am greatly indebted to Colonel Cathcart

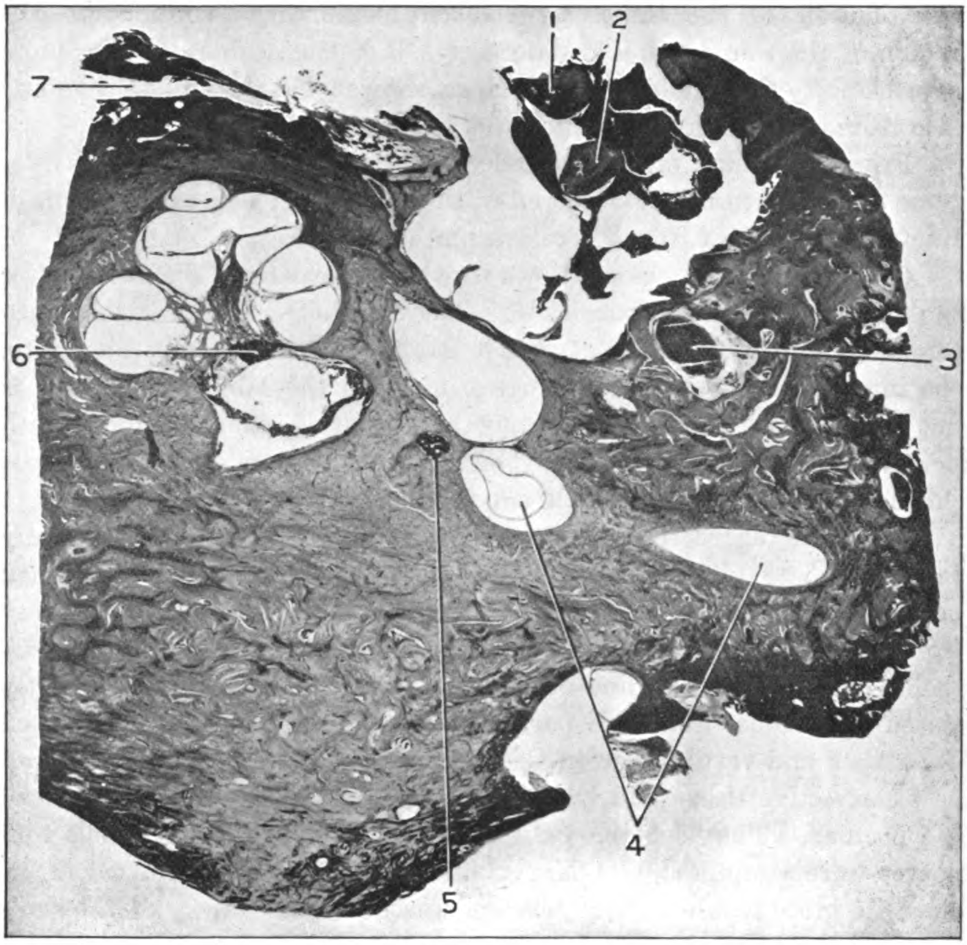

FIG. 13.

Fracture of cranial base without injury to labyrinth capsule J. P., male, aged 54. Horizontal section through right ear. No. 122. 1, malleus; 2, incus surrounded by blood-clot; 3, facial nerve; 4, the two ends of the posterior vertical canal; 5, hæmorrhage in branch of vestibular nerve to ampulla of posterior canal; 6, hæmorrhage in fundus of internal meatus; 7, hæmorrhage in Eustachian tube. (× 6.)

for his kind permission to record these cases. The history of the case was that, while stepping out of the way of an automobile, the patient was knocked down by a cable car. On admission to the infirmary the patient was pale, irritable and restless; pulse 64, temperature 96° F., respiration 28. Swollen bruised areas were present on the back of the scalp and above the left ear. There were no signs of injury to the body or limbs. There was profuse bleeding from the right ear, but *no flow of cerebrospinal fluid* (as will be seen later the labyrinth capsule in this case was not injured). The right pupil was more dilated than the left. Both reacted to light. Four hours after admission the patient became comatose and the breathing stertorous. The left arm was found to be

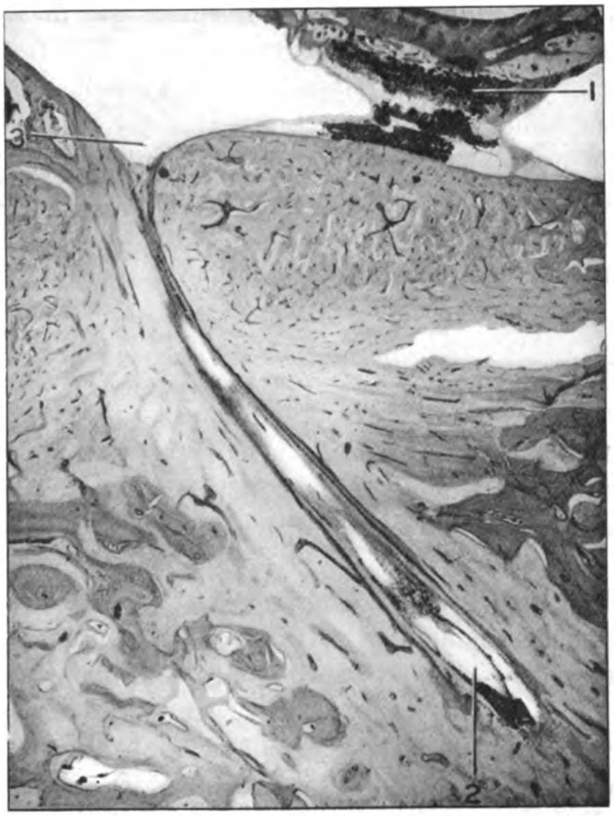

FIG. 14.

Fracture of cranial base without injury to labyrinth capsule. J. P., male, aged 54. Horizontal section through right ear. No. 170. 1, hæmorrhage in modiolus; 2, blood in perilymphatic aqueduct; 3, cochlear opening of aqueduct. (× 12.)

more flaccid than the right. Operation at 7 p.m. by Mr. Cathcart. The right temporo-sphenoidal region was trephined, but no extradural clot was found. On incising the dura dark blood escaped and a drainage tube was inserted. Breathing was quieter for a time after operation, but again became noisy at 11 p.m. At midnight, temperature 101·4° F., pulse 140. The patient died ten hours later.

Post-mortem.—The line of fracture runs along the roof of the middle ear cleft. The middle meningeal artery is lacerated and the roof of the tympanic cavity is splintered. The tympanum and mastoid cells are filled with blood. The jugular bulb is not injured. The fracture extends from the anterior part of the left middle fossa—where it crosses the groove for the middle meningeal artery—obliquely backwards through the squamous temporal and parietal bones to the lambda, and thence to the right parietal and squamous temporal regions. From here it passes down to a point behind the right petrous temporal, crosses the sigmoid sinus, and then runs along the anterior border of the right petrous bone.

Microscopic Examination of the Right Ear.

(1) *Middle Ear.*—The tympanic membrane is ruptured in its posterior part. Hæmorrhage is present in the mastoid antrum and cells and also in the tympanic cavity, but the joint between the malleus and incus appears normal. Blood is present in the sinus tympani and in the niche of the round window.

(2) The labyrinth capsule is not fractured, but hæmorrhage is present in the region of the geniculate ganglion and the fibres of the seventh nerve are separated by blood. There is also some bleeding in the fossa sub-arcuata.

(3) *Labyrinth Contents.*—(*a*) The cochlea only shows slight hæmorrhages in the modiolus. The scalæ of the cochlea are free from blood, but there is a little hæmorrhage in the aqueduct of the cochlea towards its cranial end. (*b*) The hollow spaces of the vestibule are free from hæmorrhage, but there is a little blood in the ductus endo-lymphaticus just before it opens into the saccus. The stapes is normal in the oval window. (*c*) The canals show no hæmorrhage either in the peri- or endo-lymphatic spaces.

(4) *Internal Meatus and Nerves.*—Hæmorrhage is present in the fundus of the meatus where the cochlear nerves enter the modiolus. There are also bleedings in the vestibular nerve and its branches to the superior and lateral canals, the sacculus and the ampulla of the posterior canal (*see* illustrations).

CASE II.

The second case is that of a stone-mason (P. B.), aged 41, who fell from a scaffold on November 1, 1910, at 8.30 a.m. The depth of the fall was only 9 ft. The patient was brought to the Royal Infirmary by the police who stated that when found the patient was conscious but was bleeding from the right ear and complaining of pain in his right shoulder. Examination on admission showed that the face was pale and the pulse feeble, 92 per minute. There was a flow of blood and cerebrospinal fluid from the right ear. (Microscopic examination showed fracture of the petrous bone involving the labyrinth

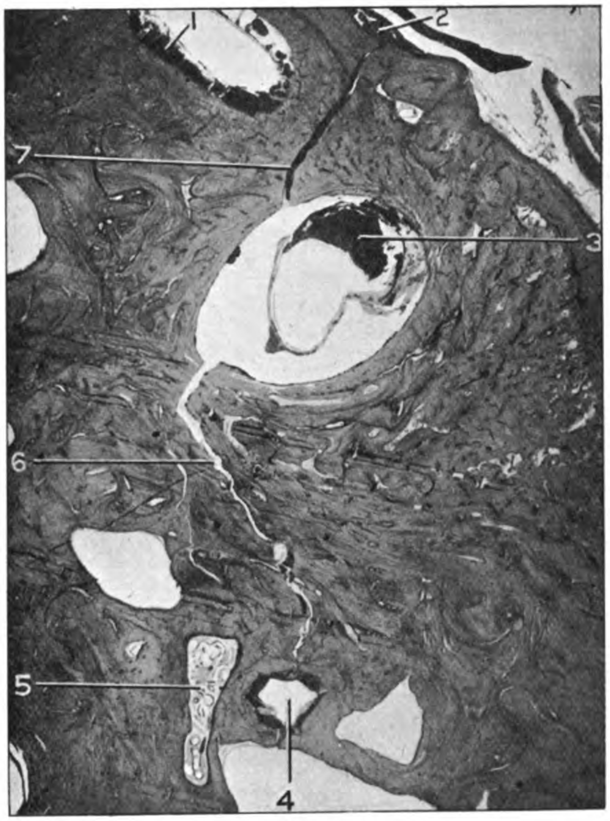

FIG 15.

Fracture of cranial base with injury of labyrinth capsule. P. B., male, aged 41. Horizontal section through right ear. No. 1. 1, blood in perilymph space of lateral canal; 2, 7, 6 and 4, show line of fracture; 3, blood in ampulla of superior canal; 5, vessels of fossa subarcuata. (× 12.)

and extending from the inner wall of the middle ear to the internal auditory meatus.) The patient was conscious but very deaf. Soon after admission coma supervened and the breathing became stertorous. A little later general convulsions came on, the eyes being turned to the right—i.e., conjugate deviation to the side of the labyrinth lesion. Later on squinting was noticed, the right eye looking farther to the right than the left one. The right pupil was more dilated than the left. The left side of the face and the left arm became paralysed, and the respiration was of the Cheyne-Stokes type. Pulse now 76. Operation by Mr. Cathcart 11 a.m. The right temporal region was

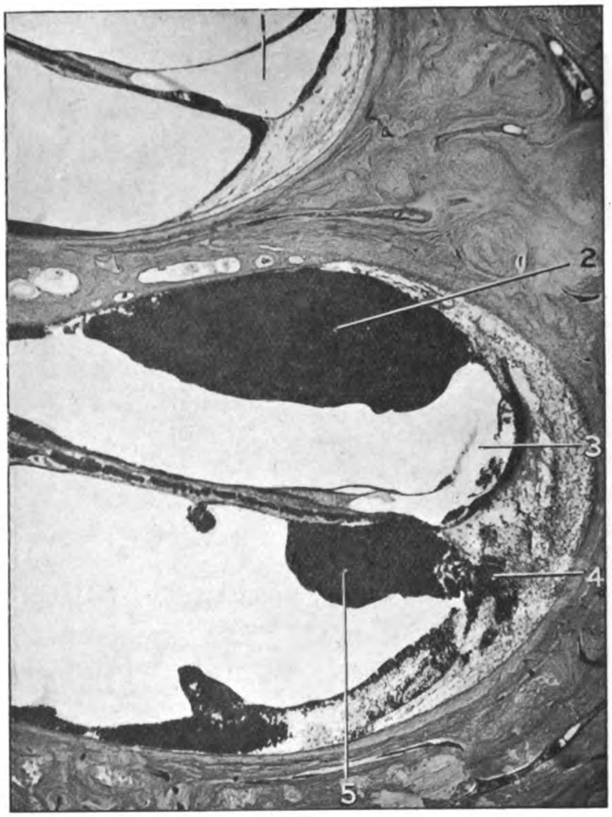

FIG. 16.

Fracture of cranial base with injury to labyrinth capsule. P. B., male, aged 41. Horizontal section through right ear. No. 78. 1, scala media of middle coil, with slight hæmorrhage; 2, blood in scala vestibuli of basal coil; 3, rupture of Reissner's membrane; 4, blood in spinal ligament; 5, blood below basilar membrane. (× 30.)

exposed and a fissured fracture found running from the anterior part of the wound downwards and backwards. A large extradural clot was exposed by the trephine opening, but the bleeding point could not be located even when the trephine opening was enlarged. The external carotid was therefore ligatured and the bleeding stopped. A drainage tube was inserted into the operation wound in the skull. Saline was injected *per rectum.* At 3 p.m. the respirations numbered 30 per minute and the pulse 128; temperature 100·6° F. The patient gradually got worse and died eight hours after operation.

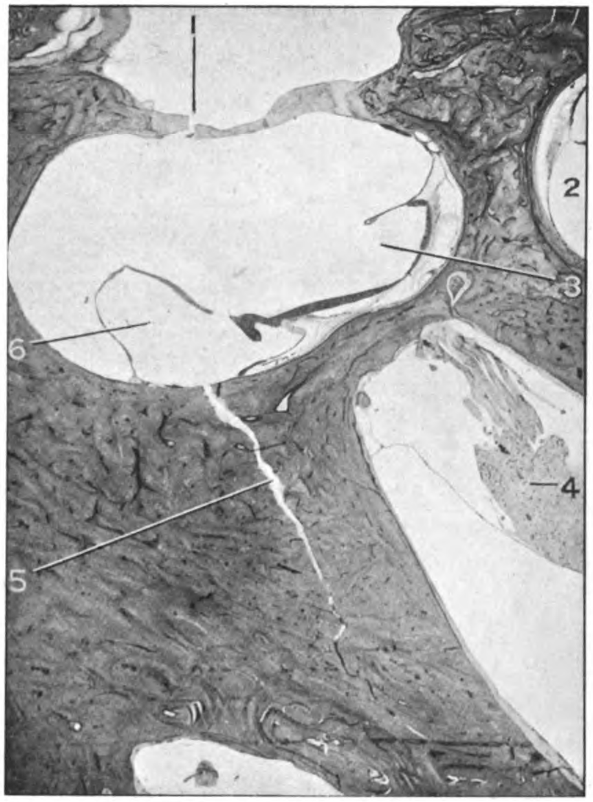

FIG. 17.

Fracture of cranial base with injury to labyrinth capsule. P. B., male, aged 41. Horizontal section through right ear. No. 125. 1, fracture through stapes ; 2, basal coil of cochlea ; 3, ruptured saccule with hæmorrhage ; 4, vestibular ganglion ; 5, line of fracture ; 6, ruptured utricle. (× 12.)

Post-mortem.— Skull thicker than normal : brain œdematous ; internal carotid arteries thickened. There is a considerable amount of clot behind the trephine opening and the brain has not expanded. A fissured fracture is present passing from the parietal bone to the squamous temporal and then along the roof of the tympanum. No laceration of brain. The bleeding came from the middle meningeal artery (posterior branch). (Subsequent microscopic examination showed that the fracture must have bifurcated, one limb passing along the roof of the middle ear cleft and the other passing inwards through the labyrinth.) In preparing the specimen for microscopic examination the outer wall of the middle ear, along with the malleus, incus and tympanic membrane became separated as they were already

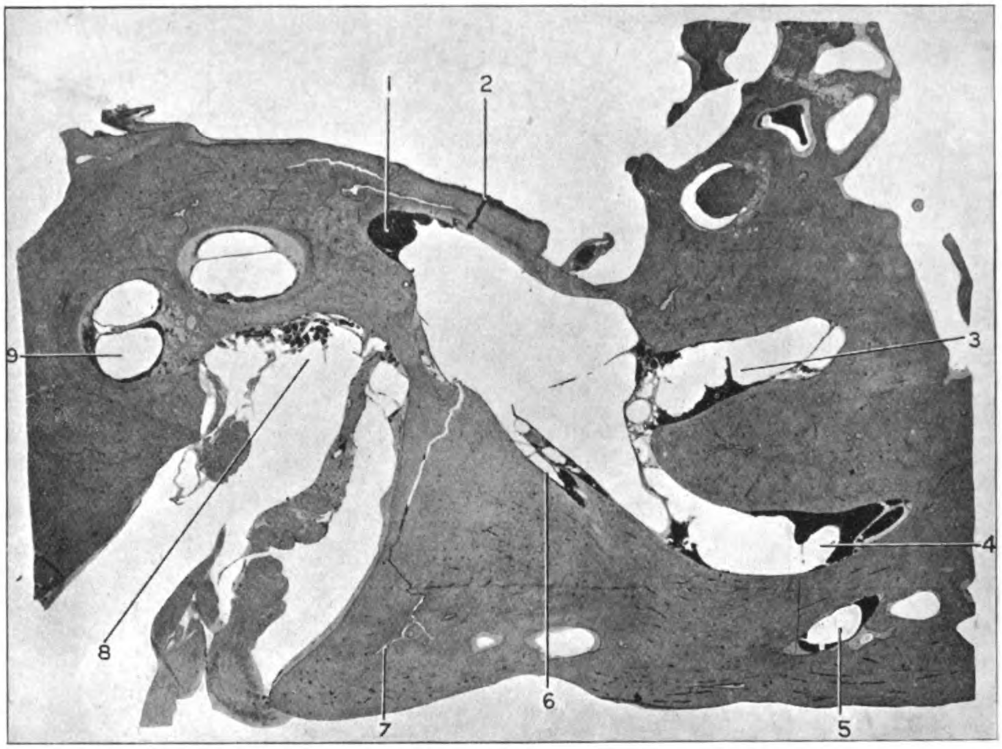

FIG. 18.

Fracture of cranial base with injury to labyrinth capsule. P. B., male, aged 41. Horizontal section through right ear. No. 175. 1, blood in scala vestibuli where it opens into vestibule; 2, line of fracture; 3, opening of smooth end of lateral canal (with hæmorrhage); 4, opening of smooth end of posterior canal into crus commune (with hæmorrhage); 5, blood in air cell; 6, blood in endolymphatic aqueduct; 7, inner end of fracture; 8, fundus of internal meatus with hæmorrhage; 9, basal coil of cochlea with blood in it. (× 8.)

loose. Blood was present in the Eustachian tube, tympanic cavity, mastoid antrum, and cells. The line of the superior canal can be seen through the bone marked out by the hæmorrhage inside. The right clavicle is fractured and there is blood behind the manubrium sterni. Both lungs showed several gummata.

Microscopic Examination of the Right Ear.

(1) As stated above the outer wall of the middle ear is absent. There is blood in many of the air cells which surround the labyrinth. On the inner wall of the tympanic cavity there is some hæmorrhage present beneath the mucosa. Hæmorrhage is also present in the niche of the round window.

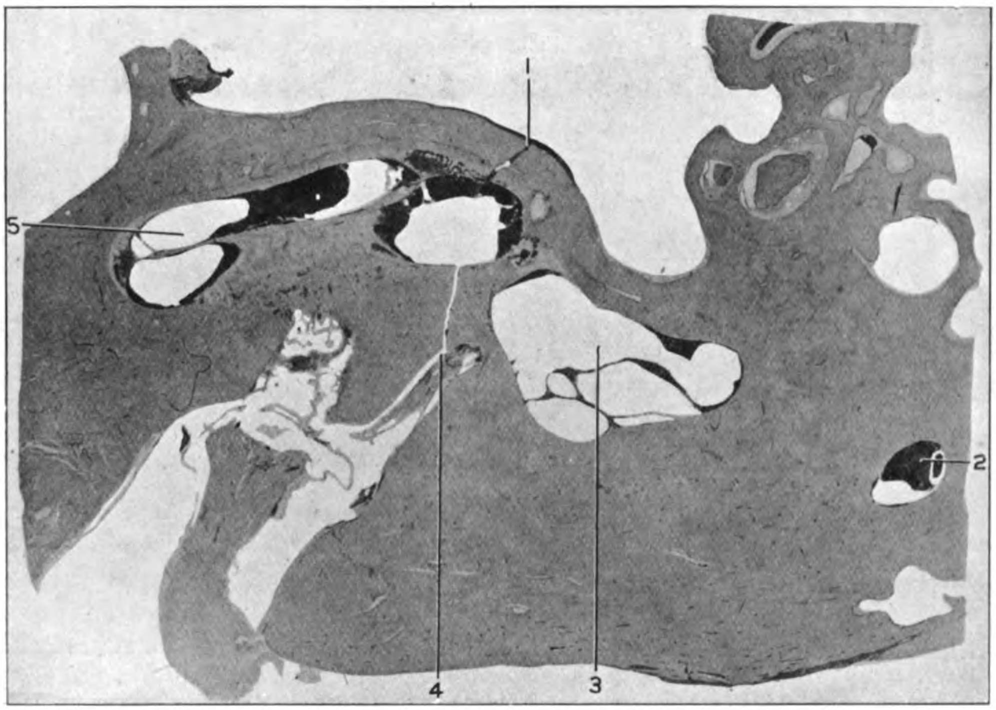

FIG. 19.

Fracture of cranial base with injury to labyrinth capsule. P. B., male, aged 41. Horizontal section through right ear just above round window. No. 235. 1, fracture of promontory; 2, both peri- and endo-lymph spaces of posterior canal contain blood; 3, vestibule with slight hæmorrhage; 4, line of fracture reaches canal for nerve to ampulla of posterior semicircular canal; 5, basal coil of cochlea with hæmorrhage in all three scalæ. (× 8.)

(2) *Labyrinth Capsule.*—The line of fracture passes through the superior and external canal, downwards through the oval window, involving the stapes and below this through the promontory. The fracture extends inwards and reaches the internal meatus but does not extend to the dura covering the posterior surface of the petrous bone. There is no hæmorrhage along the facial nerve in the aqueduct of Fallopius, although the bony walls of the aqueduct are involved in the fracture. The posterior crus of the stapes is broken. On passing internally the line of fracture divides—one limb reaching the internal meatus and the canal for the nerve to the ampulla to the posterior canal, while the other limb stops short of the dura of the posterior fossa.

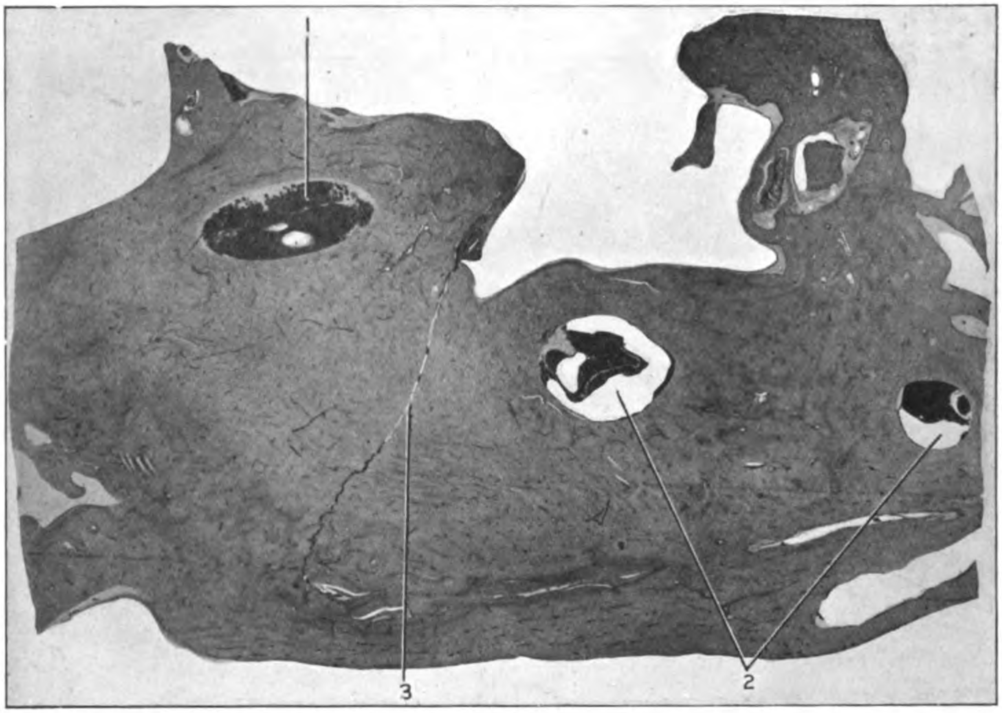

FIG. 20.

Fracture of cranial base with injury to labyrinth capsule. P. B., male, aged 41. Horizontal section through right ear below round window. No. 300. 1, extensive hæmorrhage in spiral ligament in lowest part of basal coil of cochlea; 2, both ends of posterior canal show blood in endo- and perilympth spaces; 3, line of fracture which does not quite reach dura mater of cerebellar fossa. (× 8.)

(3) *Labyrinth Contents.*—(*a*) Cochlea: There is marked hæmorrhage in the spiral ligament and in the scala tympani and vestibuli, especially in the basal coil. There is very little blood in the cochlear canal itself. In the middle coil there is no hæmorrhage except in the spiral ligament. There are a few small scattered hæmorrhages in the modiolus. The ductus perilymphaticus is free from blood. (*b*) Vestibule: The utricle and saccule are ruptured and there is blood in both the peri- and endo-lymphatic spaces of the vestibule. The ductus endo-lymphaticus also contains hæmorrhage. (*c*) Semicircular canal: Blood is present in the endo-lymphatic and peri-lymph spaces of the superior and external canals. The branch of the vestibular nerve to the cristæ of these canals shows extravasated blood. There is considerable hæmorrhage in the crus commune and in the peri- and endo-lymphatic spaces of the posterior canal.

(4) *Internal Meatus and Nerves.*—There is slight hæmorrhage along the vestibular nerve, especially along the branch to the saccule. The branch of the cochlear nerve to the basal coil also shows hæmorrhage. Although the fracture reaches the fundus of the internal meatus there is comparatively little hæmorrhage present in the meatus.

DISCUSSION.

The **PRESIDENT**: We are very much indebted to Mr. Fraser for these excellent specimens. Those showing the fractured base of the skull are particularly interesting to me. At a general hospital we are constantly seeing cases with fractured base, but usually not until some weeks after the accident, so that one cannot judge of the conditions immediately after the fracture; when they come to us, all that can be made out is, that they have complete nerve deafness. It would be interesting to know what is the effect sooner after the accident. For a long time I have tried to get the surgeons to let me know when the patients come in, but I hardly ever have the opportunity of seeing them in a recent stage. Having seen these specimens, I shall make a further effort to see if tests cannot be carried out immediately after the accident, instead of, as at present, weeks or months afterwards, as a collection of specimens with a complete examination of the hearing would be very valuable.

Mr. C. ERNEST WEST: I am obliged to Mr. Fraser for showing us these specimens. I should like to ask a few questions with regard to the case of otosclerosis. This woman was aged something over 60 when she met with her death. How long had she been deaf? How long does Mr. Fraser think the condition had been going on—if it had been going on at all? If it had not been going on, what was the exact nature of the resting condition? And what is it that leads to progress in one case and to arrest in another? Histologically, are these patches of so-called ostitis vasculosa inflammatory tissue, or are they merely altered tissue—post-inflammatory tissue? I think that one very important point which Mr. Fraser brought out in connexion with his previous demonstration was the anatomical feature respecting the existence of a layer of what one might call cancellous bone really surrounding the true capsule of the labyrinth, and lying between it and what one might call the adventitious capsule, which is really a part of the petrosa. That seems to be the central part of his work so far as it affords a basis for the spread of an inflammatory and presumably infective process, whether it has penetrated from the tympanum or has originated by deposition, by blood infection. This case, in which there are apparently typical otosclerotic lesions on the one side and manifest results of past suppuration on the other, does lend colour to the theory that otosclerosis is essentially an infective or post-infective process originating in the tympanum. I reluctantly admit that I have been struck by Mr. Fraser's demonstration in that sense. I think it is important that we should arrive at a definition of what we mean by otosclerosis—whether a pathological process demonstrable histologically, or a clinical condition of a certain type as regards appearances, symptoms, and the like. At present we are a little liable to be at cross-purposes in our discussions, because we do not know whether we are talking of a pathological process demonstrable under the microscope, or of clinical types of deafness familiar to all of us. Before I sit down I should like to make a protest on the ground of accuracy in the use of terms. I am an upholder of exactness of phrasing as far as possible. The term I object to is "chronic adhesive process." I do not know what it means. I do not see any evidence for it in Mr. Fraser's slides. I see evidence of post-inflammatory conditions, but I see no reason why this should be called a chronic thing, any more than one's boot is chronic because it is always on one's foot. The condition is a resting one, and "chronic" to my mind implies a process which is going forward. It may be that there is a cicatrized tympanum—that there has been post-suppurative cicatrization. That is the way I should like to see it described. Ultimately, it seems to me, the turning-point of the discussions will hinge on the question of ætiology. When we have arrived at some clarified ideas with regard to ætiology, it is conceivable that we may arrive at some ideas as to treatment. I do not mean treatment when the patient has a developed otosclerosis, but treatment rather in the preventive or the abortive sense. It is extremely important that we should have laid before us, in as categorical a manner as possible, the views of those who are working on the subject as to whether this is a definitely infective condition—as to whether the process is due to some toxic or degenerative change taking place in tissue naturally prone to it, or whether we have to do with a chronic osteomyelitis. If so, there ought to be changes taking place progressively, and such appearances as Mr. Fraser has shown this evening in this woman aged 60 ought to be different from those in a patient aged 25 who is a progressive otosclerotic. That seems to me a point which Mr. Fraser should take up. There is one other point that appeals to me, and that is the light which is thrown upon the formation of labyrinthine sequestra. One is familiar with the way in which the labyrinth is sometimes shelled out, with the inner layer of the capsule intact, over wide areas, not only in septic but in tuberculous cases, and we see a reason for that demonstrated in this cancellous sheath which runs round and over the ossified cartilage of the primary labyrinthine capsule. I have been leading nowhere, I fear, except to ask questions, but I am very grateful to Mr. Fraser for what he has shown us.

Dr. DAN MCKENZIE: I have always listened with pleasure to what Mr. West has to say, and it has been very interesting to hear from him that he has been convinced by to-day's demonstration that the inflammatory changes in the ear may lead to ostitis vasculosa. We have only seen two cases, however, in which this has occurred, and one would like to see more before arriving at definite conclusion, since both of these cases may simply have been coincidences. We do not know anything about their previous history; they are simply post-mortem specimens. This should make us wary about over-estimating their value in controversy. On the other hand, it is difficult not to believe that there is some connexion between inflammatory changes and these bone changes in the ear. It is not surprising that there should be such bone changes in inflammation of the mucosa of the ear. We must never forget that Politzer's typical otosclerosis, according to him and his fellow-workers, is characterized by the fact that in the mucosa of the middle ear there are no changes to be seen, and in the patient there is no history of former attacks of middle-ear trouble. It is difficult, I admit, to exclude all middle-ear trouble of infancy. I suppose very few of us have escaped such attacks, and yet the cases of otosclerosis among the generality of us would be insignificant. In other words, we have the association of a common occurrence and an uncommon sequel, and when this is the case there must be a third factor intervening to explain the sequel. It is true that another point in favour of the local cause is—what seems to be the case here—that one meets with cases of otosclerosis without any evidence of rheumatoid or arthritic trouble elsewhere. We get bone change precipitated locally in the ear in the temporal bone, and we naturally look for a local cause. The most obvious local cause is an inflammatory one.

Dr. A. A. GRAY (Glasgow): Mr. Fraser is to be congratulated on his results; it has been a great pleasure to inspect such beautiful specimens. Now, as regards Mr. Fraser's view as to the nature of otosclerosis, I am afraid I must say I am not entirely in agreement with him. I have examined half-a-dozen specimens of otosclerosis, and I have never seen any inflammatory change in the bone. I have never seen any round-cell infiltration nor any sign of inflammatory activity. It is difficult to accept the view of the disease being inflammatory when such a sharp line of demarcation is present. I mean that I can hardly conceive an inflammatory change stopping abruptly with the sharpness of the otosclerotic focus. It rather gives one the impression of a tumour—a new growth. With regard to infection from the middle ear being the cause of otosclerosis, it is quite true that Mr. Fraser has shown us two cases apparently illlustrating this; but one must remember the number of cases which show the contrary. I have made pathological investigations of several cases of suppurative middle-ear disease, and I have not found otosclerosis in any of them; at the same time I know that the two conditions may occur coincidently, and I think that Mr. Fraser has happened to light upon two such cases. In these one must look for some antecedent tendency. Cases which fall into this category are not necessarily chronic suppurative cases; they may be cases of acute middle-ear inflammation. I recall such a case of middle-ear inflammation; it was very painful and acute, but healed without suppuration. The patient, however, to her physician's perplexity, continued to get more and more deaf. The explanation of the condition was that there was a marked tendency to otosclerosis in her family. The left ear—which was the side affected—gradually became more and more deaf, the right ear remaining perfectly healthy all the time. But, sixteen years later, she had an attack of appendicitis, and at the same time the right ear became slightly deaf and there was tinnitus; this was followed a little later by a second attack of appendicitis, and later by a third attack, after which the appendix was removed. Then the tinnitus disappeared, the degree of deafness remaining approximately the same. This was a case of acute middle-ear inflammation exciting otosclerotic change in the bone on one side; then, after the lapse of sixteen years, the other ear began to be affected. One might say that this was a case due to infection. It may have been infection from the appendix, but it was not from any acute or chronic middle-ear inflammation. In most, if not all, of the cases of otosclerosis I have clinically examined that have apparently started from suppurative middle-ear disease, on going carefully into the patients' histories and eliciting the facts and getting information as to deafness in relations, such as uncles and aunts, as well as parents and grandparents, I have almost always found evidence of some family deafness. I do not believe that otosclerosis can occur in the majority of individuals. It is true that we never know what we carry about with us in our body, but the majority of people could not be otosclerotics by any process whatever; and, on the other hand, there are a certain number of individuals who can never be prevented from becoming otosclerotics, because the tendency is so strong. And between these two classes of persons there are a number who will become otosclerotic under certain conditions which induce changes in the bodily constitution—e.g., typhoid fever, pneumonia, exhaustion, or various other conditions of that nature. In these cases otosclerosis is contingent upon this immediate condition, but the essential factor lies in the personal quality of the individual. The organ of hearing will withstand damage from various causes up to a certain point, but beyond this in some individuals it will give way, and in others it will not give way.

Mr. R. LAKE: At the International Congress of Otology, held at Boston in 1912, Professor Siebenmann (I think it was) showed a large number of photographs, and among them were some from patients who had suffered from suppurative otitis, in which these patches of osteitis were extremely large. I am inclined to think the case we are discussing this afternoon is due to a similar condition.

Sir WILLIAM MILLIGAN: I am not prepared to argue the point from microscopical appearances, because I have done so little work on otosclerosis along this line. But I think it will be difficult for Mr. Fraser to prove that otosclerosis is secondary to a septic condition of the middle ear. The number of cases of suppuration of the middle ear is legion, but the number in which otosclerosis is present as a complication is very small. We have, I think, to look to an entirely different ætiological factor as the causative agent; probably it will be found to be some anomaly in one or other of the internal secretions of the body. I have always been struck with the relation between anomalies of menstruation and otosclerosis. The time at which the otosclerosis first manifests itself in young girls is about that at which menstruation commences. I am not prepared to say it is a question of cause and effect; it is only a striking fact. There is a deficiency of lime salts in the blood of many of these otosclerotics; is that connected with the production of the disease? Against Mr. Fraser's view there are also the objective evidences from clinical examination. In many of the vast number of cases of otosclerosis there is no sign of there having been any middle-ear disease, nor any history of such either. I quite agree with Dr. Gray that we have closely to investigate the family history of these patients; if we do, we shall find some hereditary tendency, and most frequently on the female side. It may be a case of hereditary transmission of defect in internal secretion. There will have to be a great deal of work done by Mr. Fraser before it will be possible for him to convince the Section that otosclerosis is the outcome of a previously existing, or actually existing, suppurative otitis media.

Mr. FRASER (in reply): I am very much obliged to the members of the Section for the way in which they have received my communications. The President's remarks emphasize the need for the co-ordination of research. General surgeons tell us that in cases of fracture of the base the deafness only comes on after the patient has more or less recovered from his injury. I maintain that this is not so. The deafness is present all the time, but only becomes manifest when the patient recovers control of his mental faculties and finds that in one—more rarely in both—ears the hearing has been lost. I feel sure that if such cases were examined by otologists, these views would be found correct.

With regard to otosclerosis, the theory that I support—namely, that in many cases otosclerosis is due to an inward spread of otitis media into the labyrinth capsule—has met with a good deal of criticism.

In answer to Mr. West, I can only say that I am sorry that the clinical history of my case is so imperfectly known. Mr. West objects to the term, "chronic adhesive process." It is quite possible that a better term might be invented, but the words serve to indicate the conditions which exist in the middle ear when a catarrhal or purulent otitis media results in the thickening of the tympanic mucosa and the formation of adhesions. In some of these cases, at any rate, the old term "chronic catarrhal otitis media" is really more accurate as an inflammatory process is still going on. In other cases the term "cicatrized tympanum" would be more correct.

Sir William Milligan and Dr. Gray do not agree with me as to the inflammatory nature of the changes in otosclerosis. I have never maintained that otitis media is the "be all and end all" of otosclerosis. We have all suffered from head colds and a certain amount of tracheitis and bronchitis, and yet we do not all have chronic bronchitis or bronchiectasis. Most of us have had some indigestion and hyperchlorhydria at one time or another, and yet we do not all suffer from gastric or duodenal ulceration. Every case of catarrhal rhinitis does not settle down in the middle meatal region and result in nasal polypus formation. In the same way very many children have attacks of otitis media, and yet they do not all develop otosclerosis later in life. Undoubtedly there is another factor—the hereditary tendency to the disease. In susceptible people the region of the oval window is a *locus minoris resistentiæ.* If a child with a tendency to otosclerosis gets an attack of otitis media, I believe that otosclerosis is very likely to develop. Dr. Gray made some remarks last May which appear to me to show that he also was inclined to this view. There is also a growing amount of evidence to support the view that in certain families cases of otitis media are specially likely to develop intracranial complications. The only way to get rid of the hereditary tendency would be to forbid people to marry if there was a strong tendency to otosclerosis in the family. Koerner takes this line, but it seems rather a "large order."

If Sir William Milligan will read the conclusions to the article by Mr. Muir and myself in the November issue of the *Journal of Laryngology,* he will see that we do not claim that all cases of otosclerosis are secondary to otitis media. We believe that there is a "primary" variety which occurs with an apparently normal middle ear, and is usually seen in young women. In such cases the infection probably comes by way of the blood-stream, and the condition appears to be allied to osteomalacia. In the second class of case the otosclerosis is "secondary," and is due to an inward extension to the labyrinth capsule of an otitis media. In this variety the sexes are probably affected more or less equally. Lucae was of opinion that in chronic progressive middle-ear deafness it was impossible to draw a sharp line between cases of chronic adhesive process in the tympanum and those in which otosclerosis was present, and I believe that subsequent observations will still further support that view.

The most important question to decide is this: Is otosclerosis an inflammatory condition, or is it not? I believe that it is, but my opinion is not of great value. It is a very different matter with regard to the opinion of Mr. Richard Muir, who is one of the best known pathologists in this country. Mr. Muir holds that otosclerosis is undoubtedly of inflammatory origin. Dr. Gray can see "no sign of inflammation" and yet in the osteoporotic areas we find rarefied bone, in the spaces of which there are dilated blood-vessels surrounded by numerous small cells. Giant cells are also found in many cases. These appearances bear strong evidence of an inflammatory character.

I have been asked why, if otosclerosis follows otitis media, it is always located in the anterior margin of the oval window. I have shown you that in the present case the area of otitis vasculosa in the left ear was much more extensive, and affected not only the anterior margin of the oval window, but also the bony prominence of the external canal and the apex of the cochlea. I think it was Politzer who showed that at the anterior margin of the oval window there is a vascular connexion between the vessels of the middle ear and those of the labyrinth capsule. Bruehl has also pointed out that this area is liable to special stress on account of the movements of the anterior part of the footplate of the stapes and the presence of the tendon of the tensor tympani muscle in this region.

Sir William Milligan believes that there is some connexion between the occurrence of otosclerosis and disorders of internal secretion. Well, of course, the ductless glands are all "the rage" at present. After failing with iodides, phosphorus, fibrolysin, otosclerol and radium, I am now doing my best to be in the fashion and am treating cases of otosclerosis with extracts of the ductless glands—pituitary, thyroid and suprarenal. As yet the duration of treatment has been far too short to enable me to give a report on the results. My own view, however, is that it is *most important to make sure that cases of catarrhal and suppurative otitis media in children really do clear up completely.* Such cases should be carefully watched and treated for a long time after the acute symptoms have passed off. It is to be hoped that the attention now being paid to the operative treatment of the nose, nasopharynx and fauces of young children may result in fewer cases of otitis media and a better recovery from this affection when it does occur. If this is so, we may expect to see a decrease in those cases of otosclerosis which are secondary to middle-ear inflammation. Vaccine therapy in cases of recurrent catarrhal otitis media may also be of use.

Since I have adopted the President's method of immediate skin-grafting at the end of the radical mastoid operation, and have observed the excellent results obtained, I have come to the conclusion that it would be quite justifiable to operate on cases of otosclerosis. I suggest that after the completion of the radical operation, the bony cap of the lateral canal should be removed without injuring the endosteum and a skin-graft applied at once. In this way a movable window would be supplied to replace the ankylosed oval window. The operation should, of course, in the first place be performed only on the more affected or deafer ear.

Dr. Dan McKenzie suggests that it may merely be coincidence that in these two cases otosclerosis was associated with otitis media. If this is his opinion, I do not agree with him. In the present case the patient had only slight remains of otitis media on the right side, but on the left there was a marked adhesive process in the upper part of the tympanum, while a perforation was still present in the lower part of the drumhead. It was on this left side also that the osteoporotic changes in the labyrinth capsule were most marked. The bony ankylosis is also more extensive on the left side.[1]

There does seem to be a loss of trophic nerve influence in cases of otosclerosis as evidenced by diminished sensibility of the external meatus and drumhead, and diminution or absence of the secretion of wax. The question is, Which is the cause and which the effect? If otosclerosis is an inflammatory condition, it cannot be entirely due to loss of trophic influence, but it is quite possible that weakening of this trophic influence may be an important factor in the pathology of otosclerosis, indeed, it may be that this is the way in which the hereditary tendency to the disease manifests itself.

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[1] [*Note.*—January 11, 1917: Since my return from London I have examined microscopically a *third* case of otosclerosis associated with chronic purulent otitis media. I hope to show this case to the Section at an early date.—J. S. F.]

(*November* 17, 1916.)

A Note on the Monochord, with some Illustrative Figures.

By W. M. MOLLISON, M.C.

EAR tests are of doubtful value, but some of those in common use are at least interesting, and serve to differentiate cases of deafness into two main classes. Of these tests that for determining the *upper tone limit* is perhaps the most interesting: it has always been doubtful what is actually the highest note appreciated by the normal ear, and I do not think it is important. What is of interest is that the upper limit is fairly constant and can be very accurately determined. The instrument which appears to me to give the most constant results is the monochord. It consists of a length of steel piano wire stretched between two points on a steel frame on which runs a bridge; this bridge grips the wire and so alters the effective length of wire which is to be thrown into vibration. Longitudinal vibrations are produced in the wire by rubbing it with resined leather (Tyndall) or with cottonwool soaked in spirit. The great advantage of the monochord is that the note produced depends on three factors only: (1) The length of wire thrown into vibration; (2) the calibre of the wire; (3) the material. These three factors are easily standardized, and so an instrument is produced which gives always the same notes and requires no complicated standardizing when finished as is the case with Galton's whistle.

The monochord has another advantage pointed out by Mr. Scott some few years ago; not only can the upper tone limit through air be tested, but also that through bone; this possibility led to the discovery that Rinne's test with high notes is always negative. The accuracy with which the upper tone limit can be defined is most striking; a difference of ½ cm. in a length of 20 cm. is quite easily appreciated by the patient.

The results of the test are expressed in lengths of wire, the note from which the patient hears as a squeak; the result for hearing through air is placed above that through bone (the frame of the monochord being held on the mastoid process); thus for normal individuals the result is $\frac{13}{11}$ as an average.

The following are cases of shell shock or gun deafness and are chosen as typical of such cases.

	Age	Hearing for whisper or conversation speech		Monochord		Notes
1	21	4 to 5 ft.	3 to 4 ft.	$\frac{16}{14}$	$\frac{17}{14}$	In France fifteen months
2	37	1 to 3 ft.	1 foot.	$\frac{17}{14}$	$\frac{16{\cdot}5}{14{\cdot}5}$	In the artillery
3	40	2 to 4 ft.	3 to 5 ft.	$\frac{16{\cdot}5}{15{\cdot}5}$	$\frac{16{\cdot}5}{15{\cdot}5}$	Royal Field Artillery; always tinnitus after shooting
4	35	8 in. conversation	3 to 4 ft.	$\frac{30}{18}$	$\frac{18}{14}$	Shell shock and gun fire
5	26	A. c.	3 to 4 ft.	$\frac{36}{30}$	$\frac{31}{21}$	Shell shock
6	38	3 in.	4 in.	$\frac{0}{45}$	$\frac{26}{17}$	Buried by shell one month ago; previous middle-ear catarrh
7	24	8 to 9 ft.	2 ft.	$\frac{0}{0}$	$\frac{0}{0}$	Left eye destroyed by bullet; tinnitus before War; upper tone limit, ? 4,000
8	40	8 to 10 ft.	9 to 11 ft.	$\frac{25{\cdot}5}{16}$	$\frac{26}{17}$	Eight months ago a high explosive shell destroyed both eyes
9	20	6 in.	3 in.	$\frac{30}{14{\cdot}5}$	$\frac{28}{18}$	Lost both eyes from shell explosion
10	24	1 ft.	12 ft.	$\frac{18}{14}$	$\frac{15}{14}$	Tinnitus; knocked down by sandbags
11	44	1 in. conversation	6 in. conversation	$\frac{0}{18}$	$\frac{32}{18}$	Previous deafness; no shell shock; Rinne negative
12	46	4 ft.	2 in.	$\frac{22}{16}$	$\frac{42}{22}$	Tinnitus four years; much quinine in India
13	21	3 to 8 ft.	10 ft.	$\frac{13{\cdot}5}{11}$	$\frac{13{\cdot}5}{11}$	Had been exposed to very severe shelling; thirty a minute for half an hour
14	24	0	0	$\frac{34}{16}$	$\frac{34}{16}$	Functional dumbness and blindness cured by suggestion; with an electrical aid could hear quite well with left ear

(*November* 17, 1916.)

Traumatic Dislocation of the Incus, which was found lying in the Antrum in the Course of a Radical Mastoid Operation.

By W. M. MOLLISON, M.C.

C. P., AGED 38, was exposed to a violent explosion in April, 1916. The explosion occurred about 12 yards from him on his left-hand side. He was unconscious for twenty-four hours; he then found he was deaf in the left ear. Soon afterwards discharge began and has continued. He has some pain in the ear and slight tinnitus.

On examination in July, 1916, there was found a large perforation in the left membrana tympani posteriorly; there was foul pus coming from the middle ear. Hearing in the ear was *nil*.

On account of the foul otorrhœa, the radical mastoid operation was advised. This was done in October. The mastoid process was cellular, but contained no pus; the antrum was, perhaps, a little larger than normal but it contained no pus. Whilst curetting was being done in the antrum and towards the aditus to remove small spicules of bone due to the gouging, the incus was found lying quite loose and bare, and stained by powder (?). The radical operation was completed, the malleus was in position and the anterior half of the membrane affixed to it; a particle of powder (?) on a small granulation was lying over the stapes. The cavity was skin-grafted. The malleus and incus are shown.

(*November* 17, 1916.)

A Case of "Cerebellar Storm."

By W. M. MOLLISON, M.C.

DR. FAWCETT has kindly allowed me to bring forward these notes on a case which was under his care in Guy's Hospital.

Nurse P., aged 24, had a mild attack of German measles on March 7, 1916; she was apparently well in about a week, except for severe rhinitis. On March 16 she was walking in the hospital grounds when she felt sick and vomited. She had vertigo and vomited several times on March 16, 17, 18, and 19, and was quite unable to take any food at all. At the request of Dr. Fawcett I saw her on March 20. She lay in bed with her eyes closed, and through the lids the eyeballs could be seen moving. She felt very giddy, complained that objects moved from left to right and that she herself felt as if she were moving. There was marked vertical nystagmus with deviation of the eyes upwards and the quick movements of the eyes downwards.

Examination of the ears showed a little wax in the right, but a normal membrane with ? slight retraction; on the left side the membrane was a little pink in its posterior part. There was no mental clouding; she resented being turned over for examination as it made her more giddy. She retched frequently. The optic disks were normal.

Mr. Sydney Scott kindly saw her with me, and the following points were noted: The patient heard a whisper at least 8 ft. from either ear; the appreciation of low tones was normal (sixteen vibrations per second being heard). Rinne's test was positive, and the upper tone limit normal (monochord 14·5 cm.). There was no pain in the ears and she had had none. The patient yawned frequently; knee-jerks were very brisk, Achilles jerks normal, plantar reflexes flexor; abdominal reflexes present and a well-marked *white* tache; there was slight impairment of movements of pronation and supination of the right forearm compared with the left. There was a *pointing error* in the vertical plane, the arm passed much too far upwards, especially on the right side; in the horizontal plane the finger fell below the starting point on both sides, but perhaps this was due to lack of effort on the part of the patient. Lumbar puncture showed the fluid to be under very decidedly increased pressure, and one and a half test-tubes were drawn off; the fluid was clear and normal. It was not considered wise to apply the caloric tests on account of the vertigo already present.

Dr. James Taylor also saw the patient. No definite diagnosis was arrived at, but it was agreed that the condition was due to some cerebellar irritation of unknown origin. Potassium bromide was given *per rectum*. The patient could only take small amounts of lemonade and peptonized milk for the next two or three days.

On March 24 objects still seemed to move from left to right. Vertical nystagmus was still present, combined with lateral nystagmus to the left when looking to the left. There was no vomiting.

March 27: Patient was much better; lateral nystagmus to the right.

March 28: Nystagmus was now right rotatory on looking to the right, but lateral when looking to the left; no vertigo; rhinitis considerable.

The patient continued to improve, and by April 12 could sit up, though this made her feel somewhat giddy; there was then slight vertical and right rotatory nystagmus. After that the patient made a perfect recovery and she is now back at work.

(*November* 17, 1916.)

Labyrinthine Irritation in a Patient on whom a Complete Mastoid Operation had been performed some years previously.

By SOMERVILLE HASTINGS, F.R.C.S.

M. J., A YOUNG woman, aged 31, had a left complete mastoid operation performed for chronic ear discharge eight years ago. The wound healed well, and for two years she had no trouble at all. Six years ago the discharge began again and was accompanied by tinnitus, and both have continued ever since. Three years ago she began to be troubled by giddiness, and this has also continued. The giddiness comes on at all times of the day and night, and she tends to fall to the left. When first seen on November 7, 1916, the left ear and mastoid cavity were filled by foul smelling epithelial debris and pus. On removal of this, ulceration was seen on the inner wall of the middle ear, immediately below the promontory. The hearing in the right ear was good, but nothing was heard on the left by air conduction. On the left mastoid C_{64} and C_{512} forks were heard when vibrating strongly. The fistula symptom was well marked, and increased pressure produced rotatory nystagmus to the right with falling to the left. The left labyrinth reacted readily to cold, and rotatory nystagmus to the right was produced in ten seconds.

I should be glad of the opinion of members as to whether a labyrinthectomy would be desirable should symptoms still persist now that the ear is being kept clean.

(*November* 17, 1916.)

A Doubtful Case of Labyrinthitis.

By E. D. D. DAVIS, F.R.C.S.

A MARRIED woman, aged 46, attended the hospital seven and half years ago, February, 1909, for left middle-ear suppuration of twelve months' duration, with a large perforation in the lower and posterior part of the drum. She complained of tinnitus, which was arrested by compression of the carotid. She returned six weeks later with a mass of granulation tissue in the meatus, which suggested a malignant growth. The section merely showed granulation tissue, but a radical mastoid operation was performed by Major Waggett. The facial nerve was exposed and a temporary paralysis occurred, but the face recovered within two months, when the ear was healed and dry. After the operation the patient complained of attacks of vertigo, which have persisted up to the present.

When she was seen a fortnight ago the gait was staggering, and there was a tendency to fall to the left. There was no nystagmus, the pupils were equal and reacted to light; the disks were normal. The knee-jerks were exaggerated. Rombergism was well marked. Irrigation of the ear with lotion at 100° F. produced neither nystagmus nor giddiness. Irrigation with lotion at 105° F. for twenty seconds resulted in giddiness, with a tendency to fall to the same side, but there was no nystagmus. The mastoid area showed slight Eustachian discharge and debris. Hearing on the left side was considerably diminished, and bone conduction was reduced.

DISCUSSION.

Mr. J. F. O'MALLEY. In Mr. Hastings's case I advise the performance of labyrinthectomy: the patient seems much incapacitated by the attacks of giddiness and vertigo which occur in the most unexpected manner. At present the ear is useless as an organ of hearing. With regard to the tests, the disturbance of equilibrium points, in my opinion, to the labyrinth on that side being under-active. There is sufficient life in it to cause irritation, but the disturbance of equilibrium is associated with the over-action of the good side. There seems to be a difference between the fistula test response here and that which one usually gets in fistula of the external semicircular canal, which suggests a fistula, not in the canal, but somewhere round the stapes, and this may explain the altered direction of the nystagmus. I think this degree of labyrinthine defect may become dangerous at any moment by failing to indicate the spread of sepsis and, therefore, it would be well to perform labyrinthectomy.

Dr. H. J. BANKS DAVIS: Is Mr. Somerville Hastings certain that the patient has not got cerebellar symptoms? She is in a miserable condition, and before so serious an operation is undertaken I think cerebellar abscess should be excluded.

Mr. SOMERVILLE HASTINGS (in reply): I thank members of the Section for the expression of their opinions. I thought of letting the case go a little longer, and then, if the patient did not improve, of performing labyrinthectomy. I think it unlikely that she has a cerebellar abscess. The symptoms have been going on for three years, and have varied very little, which is not like the behaviour of a cerebellar abscess.

(*November* 17, 1916.)

Case of Malignant Disease of the Ear.

By SYDNEY SCOTT, M.C.

THE patient, H. R., aged 49, an engineer's fitter, had had malignant disease of the external ear which was first noticed eight and a quarter years ago.[1] Histologically the disease was a small spheroidal celled carcinoma like rodent ulcer, but contained cell-nests and involved lymphatic glands (Professor F. W. Andrewes). Three operations had now been performed during this period, and the whole of the left auricle with the bony meatus, the mastoid process, the parotid salivary gland, the whole of the sternomastoid muscle, and all lymphatic glands on the left side of the neck have been removed. The last operation was performed in May, 1916, when there was a small recurrence in the middle of the scar in the neck. Since this the left vocal cord has become paralysed, but there has been no sign of returning disease until the last few weeks, and now several nodules have appeared in the scar along the clavicle and in the posterior triangle. There is also a larger nodule which has commenced to ulcerate over the carotid sheath close to the angle of the jaw. An expression of opinion is sought as to whether any further attempts should be made to remove the disease.

The patient is presented in conformity with the recommendation of the Council of the Section that the after-history of cases shown in the past should be recorded.

DISCUSSION.

The PRESIDENT: I think it would be well to excise the outlying nodules, which are all quite small. It must be a chronic type of case. If the ulceration can be stopped, a great advantage will be gained. Are there any signs of secondary growths anywhere?

Mr. SCOTT: None, so far.

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[1] The patient was first shown in January, 1914; see *Proc. Roy. Soc. Med.*, 1914, vii (Sect. Otol.), p. 23.

(*November* 17, 1916.)

A Post-mortem Specimen of a Temporal Bone from a Case of Cerebellar Abscess.

Shown by W. M. MOLLISON, M.C.

THE left temporal bone from a patient who died with a cerebellar abscess which gave rise to no symptoms. The posterior surface of the petrous bone shows a small collection of pus lying in the pocket of dura mater over the meatus vestibuli.

(*November* 17, 1916.)

Anatomical Specimens of the Petrous Bone.

Exhibited by H. BANKS DAVIS, M.B.

THE specimens exhibited consist of many dissections of the temporal bone removed after death from patients who died from complications following suppurative otitis media, meningitis and cerebral abscess, and from patients who died of other diseases. Some of the dissections show clearly the relation of the facial nerve to the external semicircular canal.

In addition to these there are anatomical specimens of skulls and temporal bones which I have collected on the Continent and elsewhere for private and teaching purposes. They have been previously exhibited at International Congresses.

Section of Otology.

President—Captain H. J. Marriage, R.A.M.C.(T.), F.R.C.S.

(*February* 16, 1917.)

SPECIAL DISCUSSION ON WARFARE INJURIES AND NEUROSES.

Opening Address by the President.

The following remarks are based upon notes of cases kindly sent to me by Mr. Arthur Cheatle, Mr. E. D. D. Davis, Mr. Somerville Hastings, Mr. Pike and Dr. W. S. Syme, and also on an excellent paper published by Mr. Logan Turner, Mr. J. S. Fraser and Mr. W. J. Porter, a copy of which was sent to me by Mr. Fraser, in addition to the cases I have seen myself. I propose for the purpose of this discussion on warfare injuries and neuroses to deal with the subject under the following headings:—

(I) Injuries of the auricle and external meatus.

(II) Injuries of the middle ear.

(III) Injuries of the internal ear: (A) Direct injury to the labyrinth by a missile; (B) indirect injury of the labyrinth in fracture of the skull; (C) concussion deafness.

(IV) Psychical deafness.

(I) Injuries of the Auricle and External Meatus.

(*a*) Wounds of the auricle may be caused by a bullet passing through the ear or by small pieces of metal which either lodge in the auricle or pass through it; at times the ear is to a large extent torn away. In dealing with these cases all that is usually required is to clean up the wound, remove fragments of metal, and apply antiseptic dressings. If the damage is very extensive it is often possible to save the greater part of the ear by performing a plastic operation, as the blood supply to the auricle is extremely good. The chief complication which is liable to occur is perichrondritis, with at times necrosis of the cartilage, and should this take place it is sometimes necessary to dissect out the cartilage before healing will take place.

(*b*) Wounds of the external meatus are usually caused by missiles which enter either in front of, or behind the ear, and pass right through the meatus; the cartilaginous meatus appears to be most frequently affected, though at times the bony canal may also be damaged. In its course the missile often injures the facial nerve and may also cause more or less injury to the mastoid process. In one case which I saw about a fortnight after the injury, a bullet entered just in front of the tragus, passed right through the external meatus, struck the tip of the mastoid causing a slight fracture which was seen by X-rays, and emerged behind and below the mastoid process. The wound of exit was about the size of a large hazel-nut and gradually filled up without any involvement of the mastoid. There was also some weakness of the lower part of the face, but this disappeared. In the meatus there were small perforations in the anterior and posterior walls, which were granulating; these were treated by syringing and plugging the meatus. The drum was not damaged, but there was some internal ear deafness probably due to concussion.

The following case of injury to the bony meatus is recorded by Mr. Arthur Cheatle: On July 1, 1916, a nearly spent machine gun bullet accurately entered the right meatus at right angles and without injuring the cartilaginous portion reached the bony meatus, passed through the anterior wall, was deflected downwards and backwards, and emerged behind the upper third of the sternomastoid on the same side, lodging in the collar badge. The man was knocked down, did not lose consciousness, but was dazed, giddy and sick. When seen a few days later, there was slight thin discharge from the ear; the cartilaginous meatus was normal, but a swelling in the anterior and inferior part of the deep meatus, from which projected a small granulation, obscured the anterior half of the membrane. A longitudinal, healing wound of exit, 1½ in. in length, was present behind the upper third of the sternomastoid on the same side. He complained of some deafness and tinnitus, with some difficulty and pain in moving his jaw at the temporo-maxillary joint; no bony crepitus could be heard with the stethoscope on moving the jaw, but there was distinct synovial creaking. He could hear conversational voice at 6 ft., and the tuning-fork on the nose was referred to the injured side. There was no pain, giddiness, nystagmus nor facial paralysis; the nose, pharynx and nasopharynx were normal; the temperature was 99° F. The cartilaginous meatus was painted with iodine and lightly plugged with wool. After a few days the slight discharge became offensive and facial paralysis came on gradually. The ear was then syringed regularly with saline. In a few weeks the discharge ceased, and the facial paralysis gradually disappeared. It was then possible to examine the membrane which was seen to have been ruptured in the anterior inferior segment. The hearing became almost normal.

The interest of this case lies in the facts: (1) That a bullet should have so accurately entered the ear, and without causing any injury until it reached the deep meatus. (2) That so little immediate or lasting injury was inflicted. The bullet must have been a nearly spent one with a falling trajectory.

Cicatricial stenosis of the meatus very commonly results in these cases if there is extensive injury, and will cause some deafness, and in addition there may be some internal ear deafness.

Cheatle records the case of an antero-posterior bullet wound of meatus and auricle with labyrinthine (?) hæmorrhage and complete cicatricial closure of the meatus. A lieutenant, while looking through field glasses, was injured by a rifle bullet which, fired from a range of from 200 to 300 yards, passed through the palm of the left hand, glanced off the malar bone and passed through the meatus, cutting the auricle in half. He was unconscious for a few minutes and was giddy and sick on recovery. He had complete facial paralysis at first, but when examined by Cheatle two months after the injury, this had nearly disappeared. He said he had been quite deaf since the injury and that he had been unsteady in walking, as if drunk, until three weeks before examination. He also noticed that at first things tasted differently, but that had quite passed off. The wounds were healed fourteen days before examination, but with complete closure of the meatus. The deafness in the ear was absolute with Bárány's noise machine in the other, and rotation did not produce nystagmus. His own voice and the tuning-fork on the vertex and left mastoid were only heard on the right side.

(II) INJURIES OF THE MIDDLE EAR.

Rupture of Tympanic Membrane.—This has been very common and mainly due to high explosive, and is much more likely to occur when a bomb or shell bursts in a confined space such as a trench or dug-out. It is probably due to increased pressure on the drum, but one must not forget that with reference to windows the glass falls outwards owing to the rarefaction of the air after the explosion, and it is possible that this rarefaction may also have some effect on the drum. The perforation occurs in the membrana tensa, and among the cases submitted to me I have not found any record of injury to the membrana flaccida. From my own cases and from the notes of those sent to me, I could not determine that the rupture was liable to occur in any particular quadrant of the drum, but it seems to be most frequent in the lower half. Cheatle, in his notes, states that it was most frequently in the anterior and inferior quadrant; E. D. D. Davis states that it was always in the lower half; in my own cases there was a slight preponderance of ruptures in the posterior inferior quadrant, and Mr. Fraser in his article states that Japanese otologists have found that in 50 per cent. of cases the rupture is in the posterior part, in 24 per cent. in the anterior part, and in 26 per cent. along the handle of the malleus. In one case which I saw the drum had been torn from its attachment to the lower part of the tympanic ring, and Mr. Pike records a similar case. The size of the rupture varies enormously, from a small pin's head to the loss of half the drum. In cases seen within a few days of the injury, the edges are ragged and covered with dried blood, but later the edges become quite smooth.

In a case reported by Mr. Mollison at the last meeting of this Section, owing to an explosion at a munition factory the drum was completely destroyed and the incus blown into the antrum.

The condition of the nose and nasopharynx, as far as I could determine, had nothing whatever to do with the frequency of the injury, as in the majority of the cases examined by me both were quite healthy and free from deformity.

The commonest symptoms are marked deafness with, at times, loss of consciousness for a few minutes and often slight bleeding from the ear, which may be followed by a little serous discharge; rarely there may be tinnitus and slight vertigo due to involvement of the internal ear. As regards the hearing, I found that in most cases, when tested with tuning-fork C even a few days after the injury, the bone conduction was normal, but the air conduction was diminished, the amount of diminution varying according to the extent of the damage; in several cases the air conduction was also slightly subnormal when tested with tuning-fork C_5. Complete loss of hearing has not been observed in any of the reports which have come under my observation.

If no suppuration took place, I found healing occurred in from one to three months, and E. D. D. Davis gives the time as five to ten weeks, with almost complete recovery of hearing.

As regards the frequency with which infection of the middle ear occurred, I am not able to give any satisfactory statistics, but in the cases seen by me, about 30 per cent. had discharge when admitted to hospital over here. The majority of these healed quite well, with good recovery of hearing, and in only one case have I had to open up the mastoid, and that was in a patient who had extensive injury of the pinna and external meatus. Cheatle also states that he has only once had to operate on the mastoid, and I have received no notes of any other cases. The usual treatment for ruptured drums adopted over here has been to disinfect the meatus and to keep it plugged with gauze or wool, avoiding all syringing and drops.

Somerville Hastings reports an interesting case of hæmorrhage into the middle ear: On October 6, 1916, a man was wounded on the right cheek by a bomb. When examined on October 24, the handle of the malleus was injected, and behind the membrana tympani dark coloured blood was seen. The hearing was impaired, Politzer's acoumeter being heard at 2 in. Rinne's test was negative and the bone conduction normal. On October 30 bubbles were seen in the blood in the right middle ear and the hearing distance for the acoumeter was 2½ ft. On November 13 all blood from the middle ear had been absorbed, the membrana tympani appeared a little retracted, and the acoumeter was heard at 3 ft.

Cheatle also reports a case of hæmorrhage into the middle ear due to parachute descent. An airman, aged 21 years 10 months fell a distance of 13,000 ft. in four minutes. The only ill-effects of the fall were a feeling of deafness and stuffiness in the left ear and a crackling when yawning. The left middle ear was found full of blood, with an intact membrane. The hearing was only slightly diminished. Nothing was done in the way of treatment, and in about a month the blood had become absorbed and the hearing had returned.

(III) INJURIES OF THE INTERNAL EAR.

(A) *Direct Injury of the Labyrinth by a Missile.*

These wounds as a rule are fatal, but in a few cases the patient has survived, and Cheatle has reported a particularly interesting one in which, on July 1, a rifle bullet entered the left temporal region above the zygoma and emerged just to the left of the second cervical vertebra. He was unconscious for about twelve hours, and was then able to crawl back. When seen over here on July 11 by Dr. Collier, his general condition was good, temperature 100° F., pulse 84. He was quite deaf in the left ear, from which there was a copious discharge of cerebrospinal fluid. He spoke with a husky voice. There was complete paralysis of the left trapezius and sternomastoid muscles, and of the left side of the soft palate. There was no facial paralysis. The pupils were equal and reacted to light. No loss of sensation. The tongue was protruded straight and the diaphragm moved well. A note on July 14 states he has had a variable temperature for some days, maximum 102° F.; some headache, dull and sleepy; herpes on lips. July 18: Temperature normal, pulse 64, respiration 18; general condition good; discharge of cerebrospinal fluid still profuse. August 1: All discharge from ear stopped; getting up. August 18: First examined by Mr. Cheatle, who made the following notes: "The deafness of the left ear is absolute. The tuning-fork and his own voice are referred to his right ear. Complete absence of vestibular reaction to cold syringing. No discharge from the ear; the membrane seemed to be replaced by cicatricial tissue, and no details could be made out. No Rombergism, no nystagmus. Recurrent laryngeal nerve paralysis of the left cord." Patient was discharged to a convalescent home with the wounds healed.

(B) *Indirect Injury of the Labyrinth in Fracture of the Skull.*

These may be caused by falls, blows on the head, or by bullet wounds. Fraser states in his paper[1] that: "If the force is applied at the side of the head in the direction of the petrous pyramid we get a longitudinal fracture which usually runs along the roof of the middle ear cleft . . . As a rule, in these cases the labyrinth capsule remains intact . . . On the other hand, if the force is applied at the back of the head, we get a transverse fracture which runs at right angles to the long axis of the petrous pyramid and always injures the labyrinth. As a rule, these fractures pass through the vestibule. The symptoms of such injuries are extreme or total deafness, marked disturbance of balancing, with loss of the cochlear and vestibular functions. If the labyrinth is injured there is an escape of cerebrospinal fluid along with blood. In the cases in which the labyrinth capsule is not injured, there is no escape of cerebrospinal fluid; but nevertheless deafness results from hæmorrhage into, or tearing of, the eighth nerve. . . . One or two of the cases with fracture of the labyrinth have been microscopically examined many years after the accident, and filling up of the hollow spaces of the labyrinth by new connective tissue and bone has been found, along with secondary degenerative atrophy of the nerve structures."

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[1] *Edin. Med. Journ.*, 1917, n. s., xviii, p. 112.

Cheatle quotes a case of bullet wound causing fracture of the base of the skull, with complete labyrinthine deafness on both sides. A bullet entered in front of the right tragus and emerged at a closely corresponding point on the left side. The anterior meatal wall was evidently hit by the bullet on the right side and it just missed the left, for the right ear was discharging and the meatus was filled with granulations. Complete bilateral labyrinthine deafness resulted. Patient had been desperately ill with left hemiplegia and discharge from the nose and wound of exit. Hæmorrhage from the nasopharynx had necessitated ligature of the right common carotid artery. The X-ray picture appeared to show a piece of metal at the base of the brain, behind the sella turcica, with radiating fracture to the vault.

(*C*) *Concussion Deafness.*

This may be due to the constant noise of the guns firing day after day, or to the explosion in the immediate neighbourhood of the patient of a shell containing high explosive. In the former case, the results are similar to those seen in peace time in naval gunnery officers and boiler-makers, and in my experience a slight amount of permanent deafness usually persists if the patients have been frequently exposed to the noise for long periods. The deafness due to the explosion of a shell is generally for a short time very severe, and at times the patient has been rendered unconscious, but as far as I know the deafness has never been absolute.

As regards symptoms the patient has often only complained of intense deafness with headache, but at other times there has been marked tinnitus in addition, and in the more severe cases there may be nausea and vomiting; it is more common for only one ear to be affected, though both may be, especially if the shell bursts just in front or behind him. When tested with tuning-fork C, I have found a positive Rinne with marked diminution of both air and bone conduction, and with tuning-fork C_5 also marked diminution of the air conduction. The drums have been normal.

A large proportion of these patients recover their hearing in the course of one or two months, but others improve very little. In one case which I saw in 1914 a shell burst just behind a lieutenant without causing him any wound, but rendered him completely unconscious for about an hour, during which time the Germans passed over him and relieved him of anything of value. When he came to, he noticed marked deafness of both ears, with intense headache, but he had no hæmorrhage from either ear, no discharge, no tinnitus and no vertigo. I saw him four days later, when he heard spoken words on each side at a distance of 2 ft., but my watch not at all, though it can usually be heard at 3½ to 4 ft. With tuning-fork C air conduction and bone conduction were both much subnormal, the air conduction being better than the bone conduction, and with tuning-fork C_5 the air conduction was again much subnormal. Both drums were healthy. Throat and nose healthy. No nystagmus. The patient steadily improved and eighteen days after the explosion the hearing on both sides had become normal.

The treatment I have adopted in these cases is complete rest in bed with the administration of bromides in the early stages and strychnine later.

As regards prognosis, I know no means of telling whether the hearing will recover or not, but as far as I can judge from cases I have seen, if marked improvement does not occur within six to eight weeks, the outlook is distinctly bad. Even where the hearing returns, tinnitus often persists. The exact lesion in these cases I have been unable to determine, as I have not been able to find any record of a post-mortem examination, but it is probably chiefly peripheral, as it is rare to find marked concussion deafness associated with a ruptured drum, suggesting that the rupture of the drum lessens the force of the explosion against the internal ear; it is possible, however, that in some cases at any rate some central injury may also occur, such as hæmorrhages into the pons, medulla or cerebellum. I hope some of the members present to-night may be able to clear up this point.

(IV) PSYCHICAL DEAFNESS.

This is usually bilateral, and is commonly seen in those who have suffered a severe shock—e.g., by being buried by a shell, without any visible injury being present. The deafness is usually absolute, nothing being heard either by air or bone conduction. It is generally accompanied by other nervous signs and symptoms, such as loss of voice, narrowing of the field of vision, tremors, irregular paralyses and areas of anæsthesia. Spontaneous nystagmus is absent. Milligan and Westmacott, in their paper read before the Laryngological Section in May, 1915, attribute this to "a temporary suspension of neuron impulses from the higher cortical cells of the central nervous system to the periphery." They state : "Our view is that the hiatus or synapse interfering with the flow of nervous stimuli is a central and not a peripheral one, for the reason that in so many of the cases of sudden blindness and sudden deafness, no trace of any peripheral organic lesion was demonstrable, and, moreover, the rapid recovery of so many of the patients we have observed is a strong argument that no lesion was ever present." To my mind this is a reasonable explanation, but I shall be glad to hear the views of others, especially of any neurologists who happen to be present.

Cheatle has recorded the two following cases: (1) During a bombardment a private suddenly became unconscious without any definite cause and remained so for two days. On recovering consciousness complete bilateral deafness was at once noticed; no giddiness, no bleeding of the ears; had spasms of the neck. No organic lesion was discovered, but the deafness remained, and he could not hear the loudest shouting or his own voice. The vestibular reaction to cold syringing was normal. (2) A Belgian soldier was blown off his bicycle in the retreat from Antwerp, and had been completely deaf in both ears, aphonic and paralysed in his left arm and leg from that time until July, 1916. Rapid recovery occurred on the application of the battery after resistance to many forms of treatment, including hypnosis.

These cases often recover with a counter-shock, with rest and massage, or upon giving an anæsthetic, and at times the administration of asafœtida and valerian is useful.

To distinguish this form of deafness from malingering is sometimes difficult, but it can generally be accomplished if a thorough examination is made, as the malingerer is very liable to give himself away during the performance of the various tests. The malingerer is usually sullen and defiant, has all his wits about him, and replies after deliberation, whereas a patient with psychical deafness has signs and symptoms of nervous breakdown.

Just one word about obturators. I believe they are of distinct benefit in saving the hearing, and that one of the simplest and best forms is plasticine wrapped in gauze; this can be moulded to the shape of the external meatus and is easily put in and withdrawn. An obturator largely advertised is the Mallock Armstrong, which is made in several sizes, but to my mind it is not so comfortable as plasticine. Plugs made of celluloid should never be used, as I am told that on one ship during a battle several men had their ears damaged by the flash of a shell setting fire to the celluloid plugs which they wore.

In conclusion, Gentlemen, I regret that these remarks are very incomplete owing to the comparatively small number of cases which came under my notice, but I hope they will suffice to start a good discussion.

The Morbid Anatomy of War Injuries of the Ear.

By J. S. FRASER, M.B., F.R.C.S.E., and JOHN FRASER, M.D., F.R.C.S.E., Captain R.A.M.C.

(From the Laboratory of the Royal College of Physicians, Edinburgh.)

INTRODUCTION.

FROM the point of view of morbid anatomy, war injuries of the ear may be classified as follows:—

(1) *Direct injuries* due to bullets or pieces of shrapnel or high explosive shell. (2) *Indirect injury* due to blows or falls on the head. These injuries may be subdivided into (*a*) those without fracture of the labyrinth capsule, and (*b*) those with fracture of the labyrinth capsule. (3) *Noise deafness* due to prolonged or intense gun fire, and (4) "*shell*" *or* "*explosion*" *deafness* (labyrinth concussion).

(1) *Direct Injuries.*—Fracture of the mastoid process or of the external meatus may occur with or without splintering of the bone. The tympanum and labyrinth may also be involved in these cases. Further, the middle and inner ear may be injured by bullets entering through the facial bones and emerging through the mastoid or remaining embedded in the temporal bone. If the patient lives the nature of the injury can best be ascertained by means of good

radiograms—both lateral and antero-posterior. In severe and fatal cases of comminuted fracture of the petrous bone microscopic examination of the ear would be a matter of extreme difficulty, but where the injury is less severe this method may be of use. In many of these cases of direct injury suppurative otitis media occurs as a result of infection, either carried in by the foreign body at the time of the injury or due to secondary infection through the Eustachian tube or external meatus. By the kindness of Lieutenant-Colonel Caird, R.A.M.C., we are able to record a case in which infection took place (Case I, *see* later).

(2) *Indirect injuries* of the ear due to fracture of the base of the skull in civil life were recently dealt with by one of us (J. S. Fraser) before this Section. We have recently examined the middle and inner ear from a case of bullet wound of the fronto-parietal region attended by laceration of the brain and hæmorrhage into the subarachnoid space (Case II, *see* later).

(3) *Noise deafness* is due to physiological over-stimulation of the auditory apparatus. Recent researches have shown that (i) *air conduction of sound is of paramount importance* in the production of noise deafness. Conduction through the tissues of the body, including the cranial bones, is of little account. (ii) *The neuro-epithelium* (*hair cells*) *of Corti's organ are first affected*, later the supporting cells are involved. The ganglion cells and nerve fibres are secondarily affected. The condition is one of so-called "degenerative neuritis." (iii) *The part of Corti's organ affected depends on the pitch of the sound.* If the noise be of high pitch the neuro-epithelium at the base of the cochlea is involved. If the noise be of medium pitch, Corti's organ in the middle coil is affected; while if the noise be of low pitch, degeneration is found in a portion of Corti's organ nearer the apex of the cochlea. These experiments confirm Helmholtz's theory of the peripheral analysis of sound.

It is very difficult or impossible to draw a line between cases of "noise" deafness and those of "shell" or "explosion" deafness, as both conditions are probably due to excessive movements of the atmosphere conveyed to the labyrinth. The explosion of a shell not only causes a great mass movement of air but produces a loud noise. It is stated, however, that the "blow" produced by the condensation of air following the explosion, reaches the ear before the noise vibration, and that it may drive the stapes inward and fix it in the oval window so as to lessen the bad effect of the loud noise which follows. In somewhat the same way the stapes is fixed in Gellé's experiment.

(4) "*Shell*" *or* "*Explosion*" *Deafness* (*Labyrinth Concussion*).—According to Lermoyez "shell" deafness is the true war deafness. Various theories have been put forward as to the pathology of this condition. (*a*) In many cases we are actually able to observe a *rupture of the tympanic membrane*, accompanied by a certain amount of *hæmorrhage*. It has been stated that in cases of shell explosion in which the drumhead ruptures, there is less likelihood of damage to the delicate structures of the membranous labyrinth than in cases in which the tympanic membrane does not give way. In the same way the internal mechanism of a watch, which has been dropped on the ground, is more likely to escape injury if the fall results in the fracture of the watch glass. Mere rupture of the drumhead, however, unless accompanied by some lesion in the labyrinth, auditory nerve or brain, would only produce a slight diminution of hearing. We know, however, that patients suffering from severe shell deafness exhibit marked or total loss of hearing. Some further lesion in the auditory apparatus must therefore be sought for.

(*b*) It has been stated that *hæmorrhages occur in the peri- or endolymphatic spaces* of the inner ear and that the delicate neuro-epithelial sacs and tubes of the *membranous labyrinth are ruptured* by the violent concussion caused by the explosion. It is supposed that in this way a gross mechanical effect is produced in the inner ear. It would appear, however, that the structures of the membranous labyrinth are well protected from concussion because they are suspended in a lymph bath inside the hollow spaces of the bony labyrinth.

Hæmorrhage may also occur in the *internal auditory meatus* with or without *rupture of the nerve fibres* which pass from the fundus of the meatus through rigid bony canals to the cochlea, utricle, saccule and cristæ of the canals.

(*c*) It has been suggested that apart from these gross mechanical changes ((*a*) and (*b*)) the explosion and the loud noise may *destroy the delicate nerve endings in the cochlea*, and so result in paralysis. The loud sound due to the explosion may paralyse the hair cells of Corti's organ, somewhat in the same way as the nerve structures of the macula in the retina are paralysed by the rays of the sun in "eclipse" blindness. According to this theory "shell" deafness, like "noise" deafness, is due to paresis or paralysis following over-stimulation. Some observers hold that the change is a biochemical one, while others believe that it is of a molecular nature. Theodore has microscopically examined one case of labyrinth concussion followed by total deafness, and found a condition of degenerative neuritis similar to that described by Manasse and Wittmaack in old people.

(*d*) It has been stated that in cases of "shell" deafness the lesions are probably to be found in the brain—e.g., hæmorrhages in the pons, medulla, and cerebellum, involving the central connexions of the auditory and vestibular nerves. Milligan and Westmacott have suggested that shell deafness is due to a temporary interference with the neuron connexions in the higher brain centres. They believe that the abrogation of function is *not* due to an organic lesion.

PRESENT INVESTIGATION.

The writers have examined the middle and inner ears from four cases of "shell" or "explosion" deafness. In each case the temporal bone on the injured side was removed by one of us (J. Fraser) within four or five hours of death. The labyrinth was not opened, but the specimen was at once wrapped in gauze soaked in 5 per cent. formol, then in waterproof tissue, and was finally surrounded by cotton-wool and packed in a cigarette tin. The lid of the tin was fixed on with adhesive plaster. All the specimens arrived in good condition, and were at once prepared for microscopic examination according to the method described by one of us (J. S. Fraser) in the *Journal of Laryngology, Rhinology and Otology* (December, 1913, page 638).

It is doubtful if our methods are delicate and accurate enough to discover fine changes in the neuro-epithelium of the labyrinth due to shell or bomb explosion, especially in cases like the present ones (Nos. III, IV, V and VI), where the hollow spaces of the labyrinth were not opened soon enough after death to allow the entrance of the fixing fluid. Further, the specimens had a prolonged journey from the Front to their destination in Edinburgh. Under these circumstances it would not be right to be dogmatic about fine changes in the neuro-epithelium or ganglion cells of the labyrinth. In one or two cases the writers have found displacement of the cupulæ of the canals and of the otolith membrane of the utricle and saccule. These may, or may not, be artefacts. In order to be accepted they would require confirmation by other observers.

There can, of course, be no doubt about such changes as rupture of the drumhead or extensive hæmorrhages into the middle-ear spaces or the internal meatus. It is interesting to note that in this latter position the hæmorrhages occur at the point where the nerves, after passing to the fundus of the meatus, enter the fine bony canals. It is just at these parts that one would expect the small vessels to rupture and the nerve fibres to give way. It appears probable that the examination of the inner ear from cases of "shell" deafness, which die from other causes some months or even years after the shell explosion, would afford information of great value as to the true pathology of the condition. The microscopic changes in the membranous labyrinth and eighth nerve would be much more evident at this period. It is therefore very important that every opportunity of examining the inner ear in such cases should be taken advantage of. We are of opinion that the sudden severe explosion and the loud sound accompanying it may probably paralyse the neuro-epithelium of the labyrinth in a manner analogous to—but more severe than—that in which noise deafness is brought about in boiler makers. If the observations of foreign otologists regarding "noise" deafness be applicable to cases of "shell" deafness, one would expect that "degenerative neuritis" would occur—at least in severe cases—and that certain definite changes would be found in the neuro-epithelium of the labyrinth and in the auditory and vestibular ganglia and nerves of soldiers who had suffered from severe shell explosion with its consequent deafness, tinnitus, giddiness and loss of balancing.

Our findings lend little support to the view that in "explosion" or "shell" deafness (1) large hæmorrhages occur in the peri- or endolymphatic spaces of the labyrinth, or (2) that rupture of the delicate neuro-epithelial sacs and tubes of the membranous labyrinth takes place. The changes we have observed will be found in detail in the reports of the microscopical examination of four cases of "shell" or "explosion" deafness (Cases III, IV, V, and VI). Briefly summarized these changes are as follows : (*a*) Rupture of the drumhead in Cases III, IV and VI. (In Case V a large plug of wax was present in the external meatus and probably for this reason the tympanic membrane was not injured.) (*b*) Hæmorrhage in the middle-ear spaces in all four cases. (*c*) Slight hæmorrhage in the scala tympani in the region of the round window and basal coil of the cochlea (Case IV). (*d*) Slight degenerative neuritis of the cochlear apparatus?—e.g., loss of hair cells, slight flattening of the acoustic papilla and disappearance of some of the supporting cells, especially in Case IV; shrinkage of the ganglion cells of the spiral ganglion; uneven staining of the cochlear nerve. (All these may be post-mortem changes.) (*e*) Displacement of the otolith membrane of the saccule or utricle (Cases IV and V), artefacts? (*f*) Displacement of the cupula of one or more of the canals (Cases IV and V) (It is quite probable that (*e*) and (*f*) are artefacts.) (*g*) The vestibular apparatus, as was to be expected, showed less change than the cochlear. The neuro-epithelium of the saccule and utricle and the cells of the vestibular ganglion in the internal meatus appear to be better preserved than the corresponding parts of the cochlear apparatus. (*h*) Hæmorrhage was observed in the fundus of the internal meatus at the points where the nerves enter the bony canals (Cases III, IV, and V).

CASE I.—DIRECT INJURY BY SHRAPNEL.

The patient presented a shrapnel entrance wound in front of the left tragus. There was no exit wound. Acute suppurative otitis media supervened and the patient suffered from discharge from the left ear and severe deafness. The case was only admitted to Colonel Caird's ward in the Royal Infirmary, Edinburgh, about a month after the injury. On admission (April 10, 1916) the pulse was 72 and the respirations 20 per minute. Temperature 97° F.

On April 16 there was a sudden rise of temperature to 103·6° F., and the pulse rose to 104. The patient complained of pain in the left ear and there was an increase in the aural discharge. On examination granulations were seen on the anterior wall of the left external meatus.

April 18, 1916: Temperature 101° F. Frontal headache present and pain in the right parietal region. Right ear normal.

April 19, 1916: Temperature 97° F., pulse 66. Occipital pain present with nausea and vomiting. The patient was examined by Dr. Logan Turner, who found slight facial paresis on the left side; spontaneous nystagmus to the left with a pointing error at the left wrist and shoulder joints; pain present on pressure over the neck muscles; mastoid tenderness on the left side and complete deafness in the left ear. The tuning-fork on the vertex was lateralized to the right (good) ear! The patient was too ill for the caloric test. On lumbar puncture the cerebrospinal fluid was found to be clear and not under increased tension.

Operation (April 19, 1916) by Colonel Caird. Granulation tissue found in the antrum along with some particles of nickel. The cerebellum was exposed behind the sinus and was found not to pulsate. On exploration a teaspoonful of pus was evacuated (*Staphylococcus albus* on culture). The cerebellar abscess was drained.

April 20, 1916: Temperature and pulse normal, headache less severe.

April 21, 1916: Temperature rose to 102° F. at 5 p.m. The patient showed signs of distress and died immediately.

Post Mortem.—Cerebellar abscess with early meningitis.

Macroscopic examination of right ear: Pus in the external meatus; small perforation of tympanic membrane; the Eustachian tube contains blood-stained mucus; granulations in the mastoid antrum; saccus endolymphaticus healthy; sigmoid sinus and jugular bulb thrombosed along with the inferior petrosal sinus. (It will thus be seen that three intracranial complications were present.)

Microscopic Examination of Right Ear.

External Meatus.—Lining membrane swollen and congested.

Tympanic Membrane.—Upper part of drumhead very thick and infiltrated; lower part perforated. There is a small irregular piece of bone with granulations around it in the middle of the drumhead. The tympanic membrane in its lower part is adherent to the inner wall of the tympanic cavity.

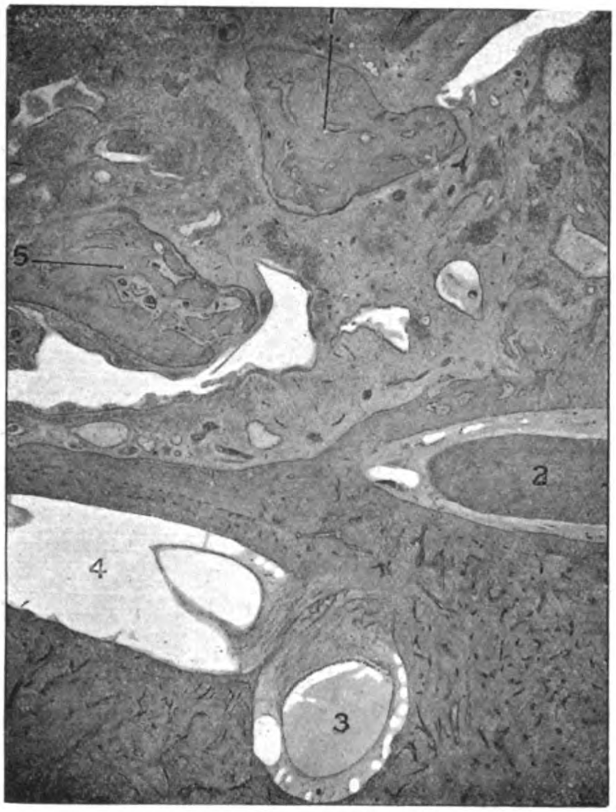

FIG. 1. (Case I.)

Direct injury of ear by shrapnel, followed by suppurative otitis media, cerebellar abscess, &c. Horizontal section 140, × 11 diam. (hæmatoxylin and eosin). 1, head of malleus dislocated from 5, body of incus; 2, facial nerve; 3, ampullary end of superior canal with coagulated lymph; 4, lateral canal.

Tympanum and Middle-ear Spaces.—The mucous membrane of the air cells in the roof of the antrum is swollen, congested and infiltrated with small cells.

Muco-pus is present in the cells and the bony walls are eroded in parts. At other parts there is some new bone formation in the walls of the cells. Some of the air cells contain a little blood. There is marked erosion of the bone on the inner wall of the attic. The mucosa of the tympanic cavity is swollen and polypoid. The canal for the tensor tympani is eroded. There is a fracture of the neck of the malleus—the lower part of the neck along with the handle being drawn inwards by the tensor tympani. The squamous epithelium of the drumhead is still attached to this lower fragment. The head of the malleus is healthy as is also the body of the incus, but the two bones are widely separated and the joint space is filled with granulation tissue. The foot-plate of the

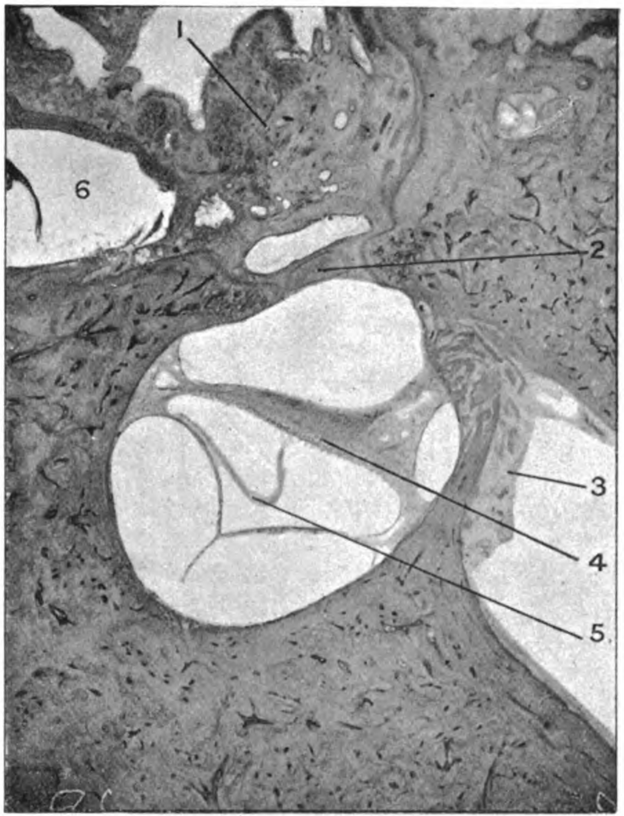

FIG. 2. (Case I.)

Direct injury of ear by shrapnel, followed by suppurative otitis media, cerebellar abscess, &c. Horizontal section 210, × 13 diam. Shows upper part of oval window with vestibule. 1, swollen mucosa in niche of oval window ; 2, foot-plate of stapes ; 3, meningitis in internal meatus ; 4, neuro-epithelium of utricle with 5, detached otolith membranes ; 6, facial canal (the nerve is absent—artefact).

stapes is fractured (*see* fig. 3, No. 5); the annular ligament shows evidence of early invasion by the inflammatory process in the middle ear. The stapedius muscle is normal, as is also the joint between the incus and stapes. The membrane of the round window is thickened and the niche is full of pus. The Eustachian tube is full of muco-pus and its lining membrane is swollen.

Labyrinth Capsule.—The vessels of the fossa subarcuata are congested. There is a small hæmorrhage in the facial canal but the nerve is normal.

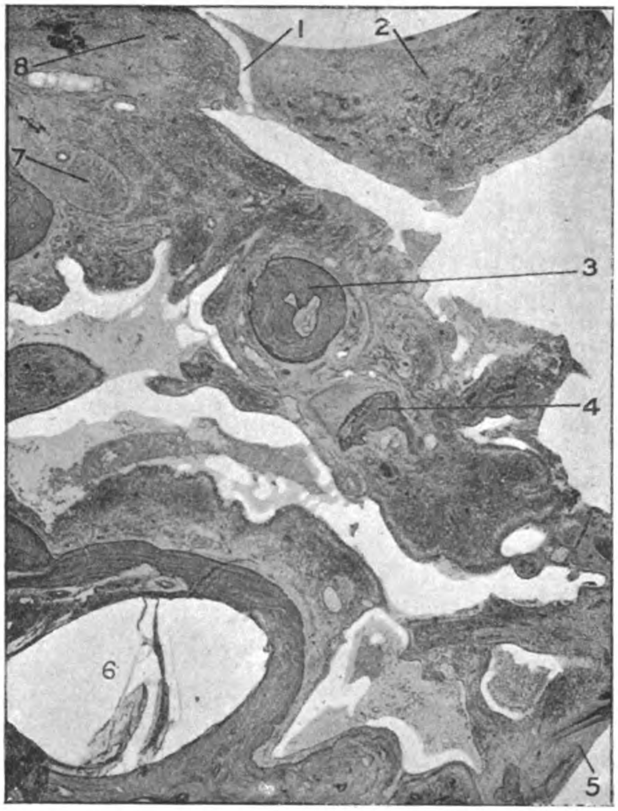

FIG. 3. (Case I.)

Direct injury of ear by shrapnel, followed by suppurative otitis media, cerebellar abscess, &c. Section 240, × 17 diam. (hæmatoxylin and eosin). Shows 1, rupture of drumhead; 2, middle portion of drumhead greatly swollen and infiltrated; 3, malleus in tympanic cavity; 4, erosion of incus; 5, fracture of stapes; 6, facial canal empty (artefact); 7, chorda tympani; 8, posterior part of drumhead.

Labyrinth Contents: (1) *Cochlea.*—There is hæmorrhage in the scala tympani of the basal and middle coils. Corti's organ presents its normal mound-like appearance in the middle coil, and the pillar cells are clearly seen.

The cochlear ganglion appears to be healthy. There is hæmorrhage in the cochlear opening of the perilymphatic aqueduct.

(2) *Vestibule.*—The neuro-epithelium of the saccule and utricle appear to be desquamated and the otolith membrane is separated. There is a small hæmorrhage in the perilymphatic space in the neighbourhood of the vestibular opening of the endolymphatic aqueduct; elsewhere the aqueduct is normal. (It must be remembered that invasion of the vestibule through the oval window was just beginning.)

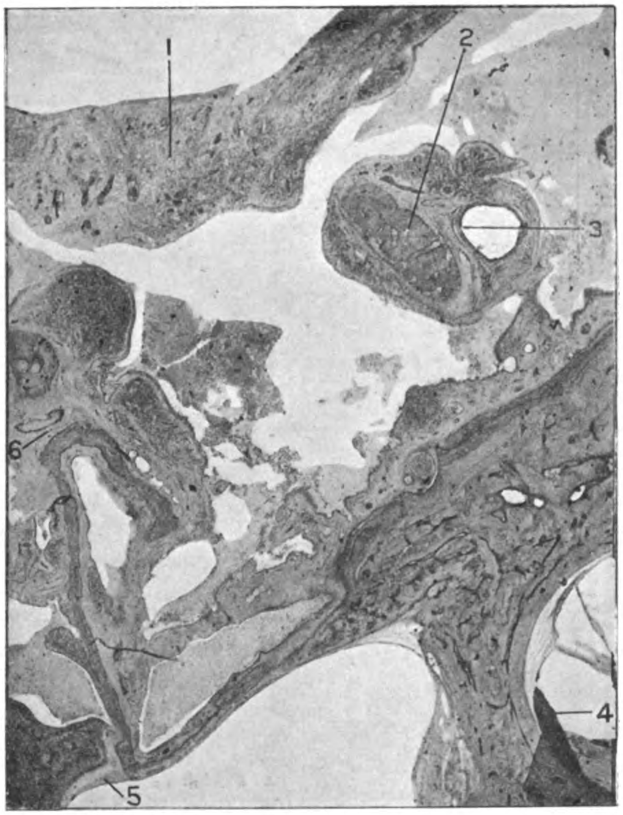

FIG. 4. (Case I.)

Direct injury of ear by shrapnel, followed by suppurative otitis media, cerebellar abscess, &c. Section 265, × 13 diam. (hæmatoxylin and eosin). 1, greatly swollen drumhead; 2, handle of malleus separated from drumhead and lying in tympanic cavity; 3, squamous epithelium of drumhead attached to malleus; 4, blood in scala tympani of cochlea; 5, infiltrated posterior part of annular ligament (early stage of invasion of vestibule); 6, inco-stapedial joint, normal.

(3) *Canals.*—The superior canal shows desquamation of the neuro-epithelium of the crista. Coagulated lymph is present but the cupula is absent. The external canal is normal. The posterior canal shows some pus cells in the perilymph space, and hæmorrhage is also present at the ampullary end. The neuro-epithelium of the crista of the posterior canal is desquamated.

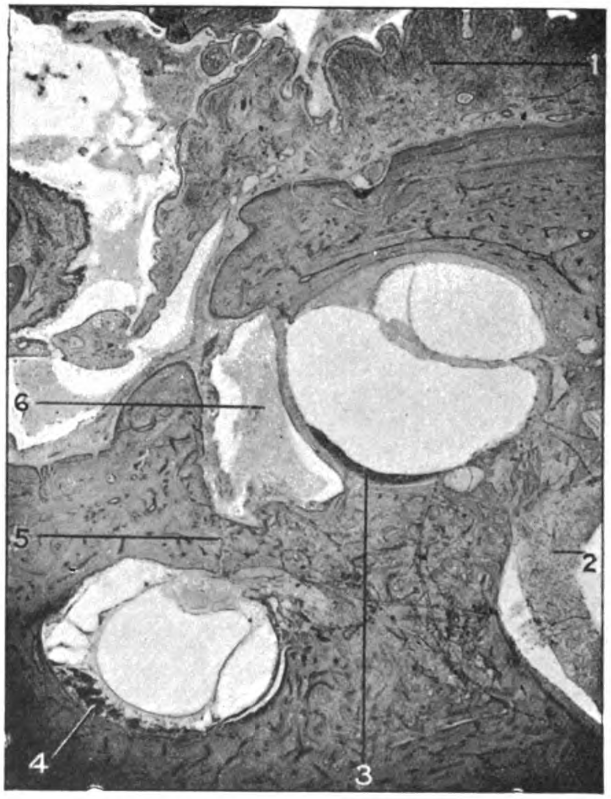

FIG. 5. (Case I.)

Direct injury of ear by shrapnel, followed by suppurative otitis media, &c. Section 360, × 11 diam. (hæmatoxylin and eosin). Shows, 1, swollen, engorged, and infiltrated mucosa on promontory; 2, meningitis in internal meatus; 3, hæmorrhage in scala tympani of basal coil; 4, hæmorrhage in perilymph space of posterior canal; 5, fracture of bone between round window niche and crista of the posterior canal; 6, niche of round window.

Internal Meatus and Nerves.—Meningitis is present within the arachnoid sheath, but the eighth nerve has been torn out at the post-mortem.

Summary.

The case was one of shrapnel injury of the left ear followed by suppurative otitis media. When the patient was admitted to the Royal Infirmary, Edinburgh, about a month after the injury, symptoms of cerebellar abscess were present. Operation revealed mastoiditis and small metallic particles in the mastoid antrum. In spite of the evacuation of the cerebellar abscess the patient died. The autopsy showed early meningitis and sinus thrombosis in addition to the cerebellar abscess. Microscopic examination of the ear demonstrated a thickened, infiltrated and perforated drumhead with fracture of the malleus. The lower part of the handle was separated from the drumhead and drawn inward by the tensor tympani. (We are unaware of any previous record

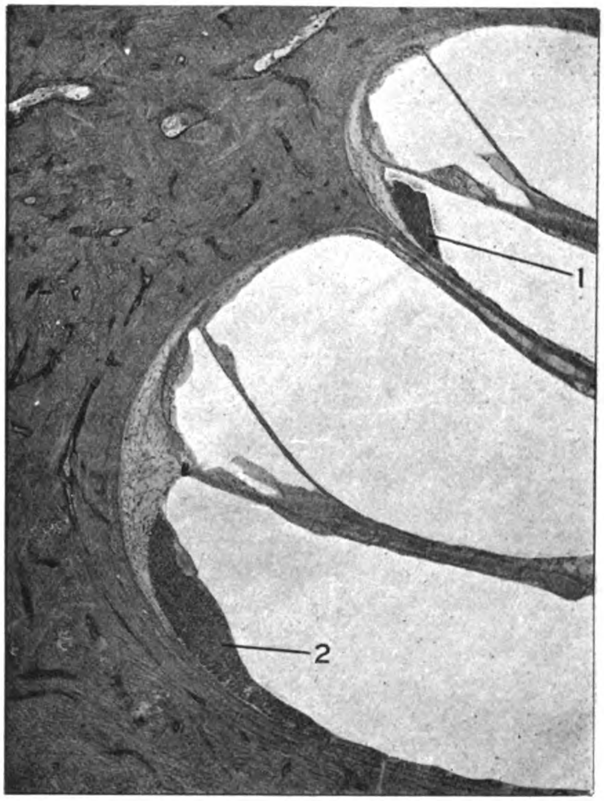

FIG. 6. (Case I.)

Direct injury of ear by shrapnel, followed by suppurative otitis media, cerebellar abscess, &c. Horizontal section 240, × 28 diam. (hæmatoxylin and eosin). Shows, 1 and 2, hæmorrhage in scala tympani in middle and basal coils.

of a similar condition.) The mucosa of the middle ear was distinctly swollen, and the tympanic cavity, antrum and cells were full of pus. The joint between the head of the malleus and the body of the incus was dislocated. The inco-stapedial joint was healthy, but there was early invasion of the vestibule through the annular ligament. The cochlea showed hæmorrhage in the scala tympani of the basal and middle coil and in the opening of the perilymphatic aqueduct, but the nerve apparatus of the cochlea appeared almost healthy. The neuro-epithelium of the saccule and utricle and of the cristæ of the canals was desquamating. The internal meatus showed meningitis.

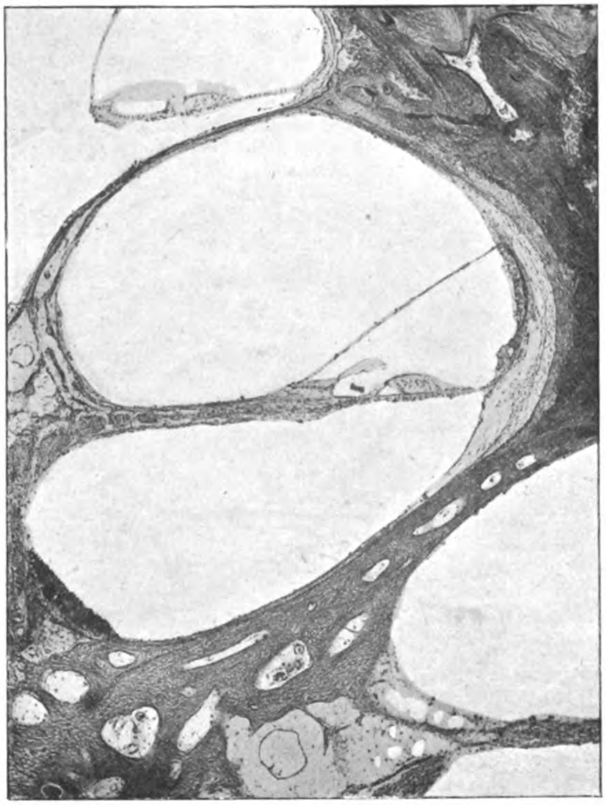

FIG. 7. (Case I.)

Direct injury of ear by shrapnel, followed by suppurative otitis media, cerebellar abscess, &c. Horizontal section 270, × 38 diam. (iron hæmatoxylin). Shows the normal (?) condition of Corti's organ in apical and middle coils. The nerves in the bony spiral lamina stain well.

Note.—Several of the changes noted in this case may have been due to small pieces of shrapnel casing—e.g., fracture of the malleus and stapes, hæmorrhage in the scala tympani and fracture of bony capsule of ampulla of posterior canal.

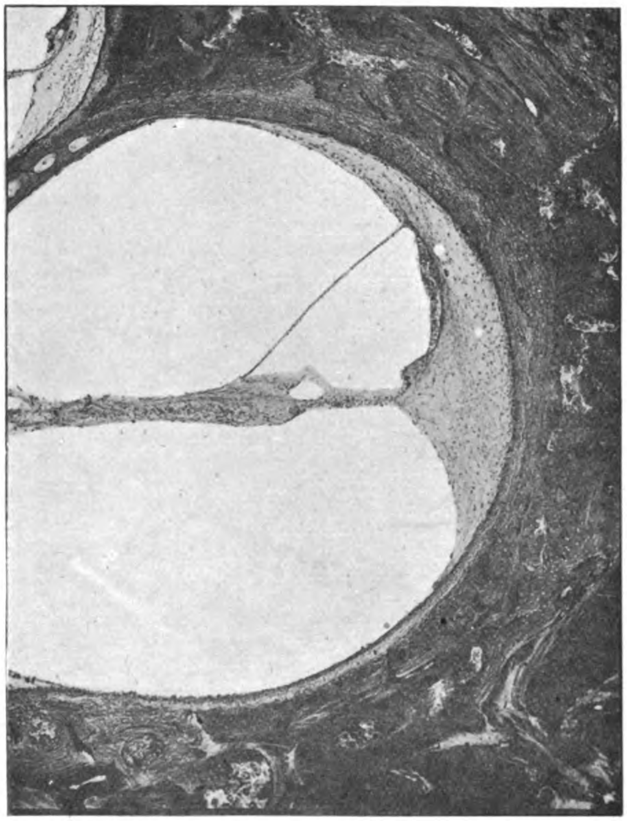

FIG. 8. (Case I.)

Direct injury of ear by shrapnel, followed by suppurative otitis media, cerebellar abscess, &c. Horizontal section 270, × 38 diam. (iron-hæmatoxylin). Shows condition of Corti's organ in upper part of basal coil. The acoustic papilla is reduced to a layer of flattened cells. The stria vascularis is normal.

CASE II.—INDIRECT INJURY OF THE EAR, DUE TO BULLET WOUND.

The patient was hit in the fronto-parietal region and the bullet came out just above the ear on the same side. There was no apparent injury of the ear itself, but the parietal bone was shattered and the brain lacerated.

Microscopic Examination.

The external meatus and the tympanic membrane are normal.

Middle-ear Spaces.—Free blood is present in the lower part of the tympanic cavity, in the niches of the round and oval windows, and in the mastoid antrum.

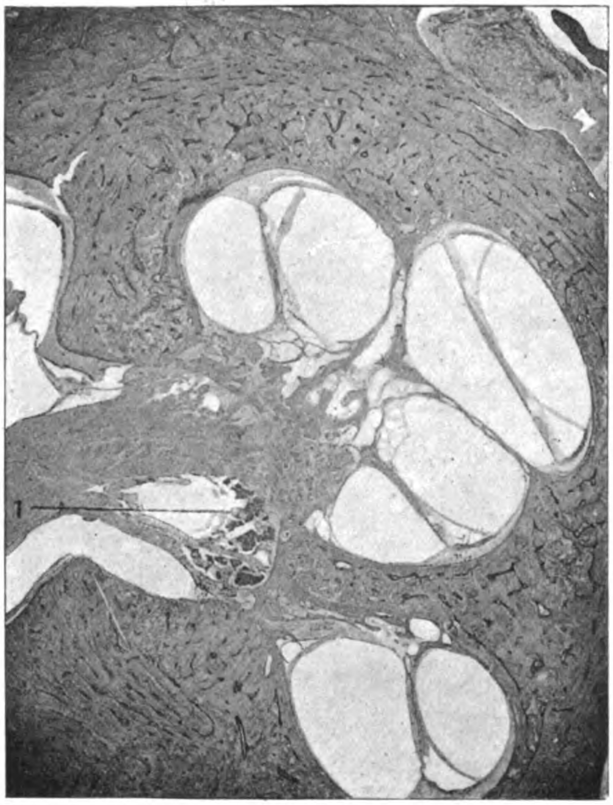

FIG. 9. (Case II.)

Bullet wound of fronto-parietal region, followed by intracranial hæmorrhage; no direct injury of ear. Vertical section 60, × 11 diam. (hæmatoxylin and eosin). Shows, 1, hæmorrhage in fundus of internal meatus between fibres of cochlear nerve. Corti's organ appears normal in middle and apical coils.

Labyrinth Contents.—The nervous structures of the inner ear appear to be normal, but a little blood is present in the aqueduct of the cochlea, near its cranial end, and also around the vestibular nerve to the utricle.

Internal Meatus.—There is a considerable amount of hæmorrhage within the arachnoid sheath which surrounds the seventh and eighth nerves. The bleeding is specially marked in the fundus of the meatus and extends along the facial nerve to the geniculate ganglion. This hæmorrhage appears to have been due to the injury to the brain and meninges.

(A similar case was recorded by Mr. Sydney Scott in the *Proceedings of the Royal Society of Medicine*, 1915, Otological Section.)

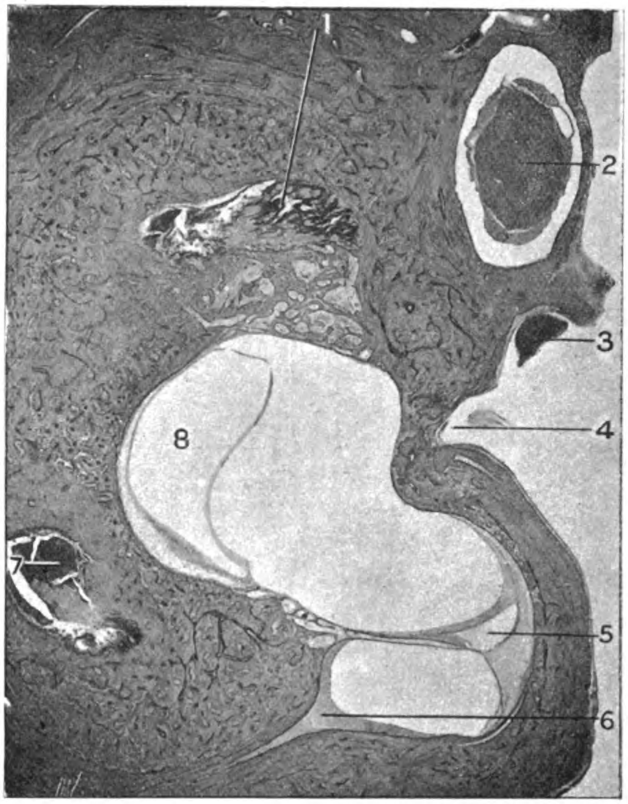

FIG. 10. (Case II.)

Bullet wound of fronto-parietal region, followed by intracranial hæmorrhage. No direct injury of ear. Vertical section 185 (hæmatoxylin and eosin). Shows 1, hæmorrhage along facial nerve above vestibule; 2, facial nerve on inner wall of tympanum; 3, hæmorrhage; 4, niche of oval window; 5, intravestibular part of cochlea; 6, opening of perilymph aqueduct; 7, hæmorrhage along nerve to ampulla of posterior vertical canal.

CASE III.—SHELL DEAFNESS.

This soldier was taking cover in a house when a high-explosive shell hit the house and burst in the room in which he was. The patient was wounded in many places. On admission to the Casualty Clearing Station the patient

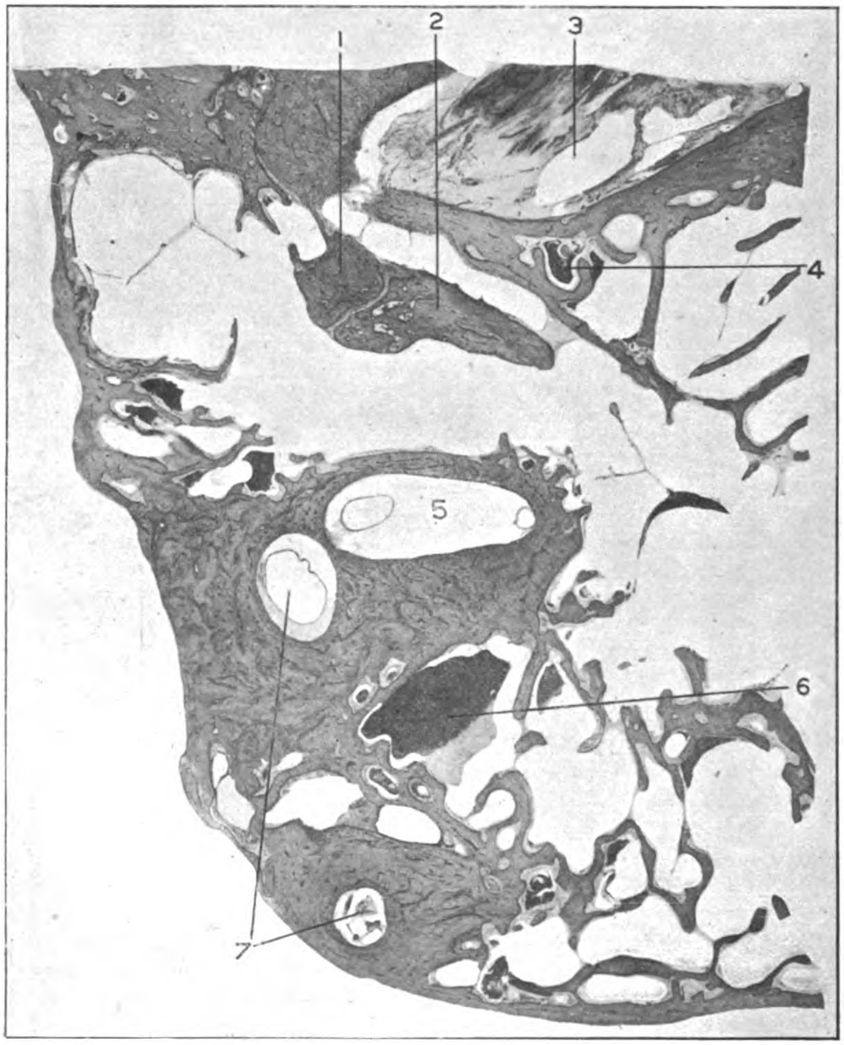

FIG. 11. (Case III.)

High-explosive shell injury of ear. Horizontal section, No. 60, × 6 diam. Shows hæmorrhage in border cells and also in air cells on inner wall of antrum. 1, malleus; 2, incus; 3, external meatus; 4, blood in "border" cell; 5, lateral canal; 6, blood in air cell; 7, two ends of superior vertical canal [the nearer (smooth) end contains bone chips—artefact].

was found to be semiconscious with subnormal temperature, small rapid pulse, cold clammy skin and multiple small wounds. In fact he showed the usual signs of high-explosive shell injury, including marked deafness. He died twenty-four hours later from shock.

Naked-eye examination showed a large ragged hole in the anterior part of the left tympanic membrane. The inner wall of the tympanic cavity was seen to be congested. The mastoid antrum and air cells appeared to be normal along with the Eustachian tube, saccus, jugular bulb and carotid canal.

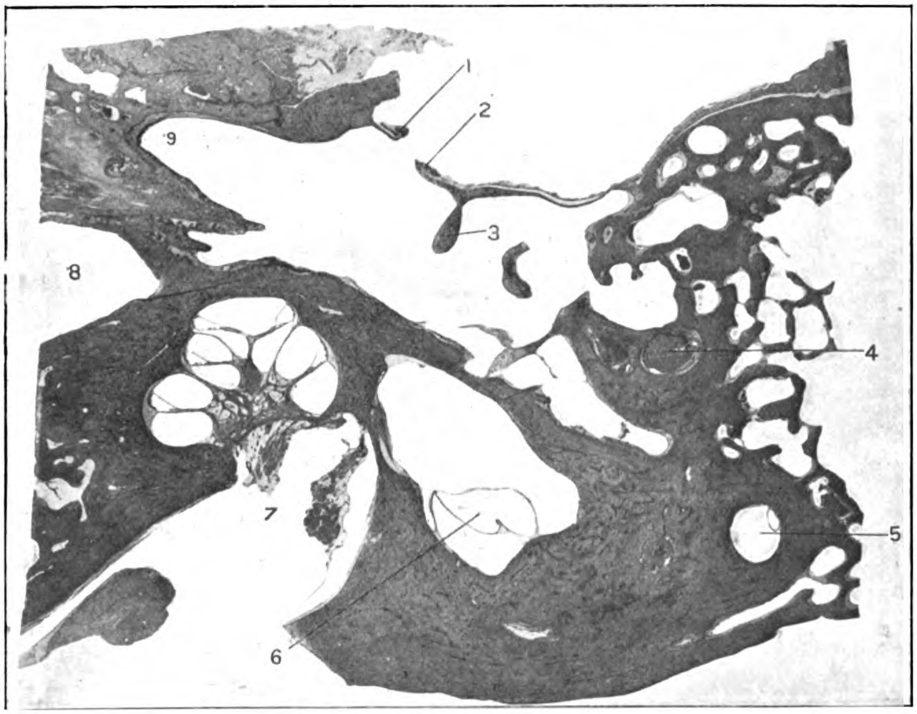

FIG. 12. (Case III.)

High-explosive shell injury of ear. Horizontal section, No. 200, × 6 diam. (hæmatoxylin and eosin). Shows rupture of anterior part of drumhead with everted edges. 1, anterior portion of ruptured drumhead (everted); 2, posterior margin of rupture, also everted; 3, malleus; 4, facial nerve with stapedius to the left; 5, smooth end of posterior vertical canal; 6, lower part of utricle with crista quarta; 7, internal meatus; 8, carotid canal; 9, tubal part of tympanum.

Microscopic Examination.

Drumhead.—This is ruptured in the anterior inferior part. The edges of the rupture are everted and show a little hæmorrhage. The rupture extends as far as the handle of the malleus.

Middle-ear Spaces.—There is a little hæmorrhage in the floor of the tube, in the niche of the round window and also on the promontory. There is slight bleeding in the air cells in the roof of the mastoid antrum and also in the border cells between the aditus and the external meatus. The tympanic ossicles and muscles are healthy. The oval window and the facial nerve are normal.

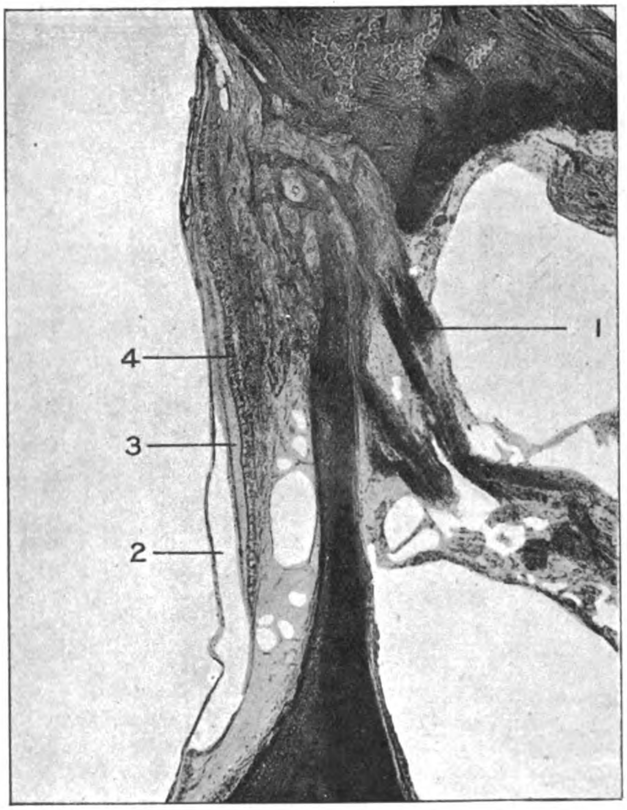

FIG. 13. (Case III.)

High-explosive shell injury of the ear. Horizontal section, No. 203, × 33 diam. (iron-hæmatoxylin). Shows normal condition of sacculus. 1, nerve to saccule; 2, cavity of saccule; 3, otolith membrane; 4, neuro-epithelium of saccule.

Hollow Spaces of the Labyrinth: (1) *Cochlea.*—The scala tympani and the scala vestibuli are healthy. Corti's organ is well formed; the pillar cells and other supporting cells are well seen, but the hair cells are not visible. The nerves in the modiolus and the spiral ganglion are normal.

(2) *Vestibule.*—The utricle, saccule and endolymphatic duct, along with the perilymph spaces all appear to be healthy.

(3) *Canals.*—These appear to be normal, along with the nerves supplying the cristæ.

Internal Meatus and Nerves.—The vestibular ganglion is healthy, but there are small hæmorrhages in the fundus of the internal meatus where the branches of the cochlear nerve to the basal coil enter the modiolus, as well as in the narrow canal for the nerve to the ampulla of the posterior canal.

(*See* figs. 11 to 17.)

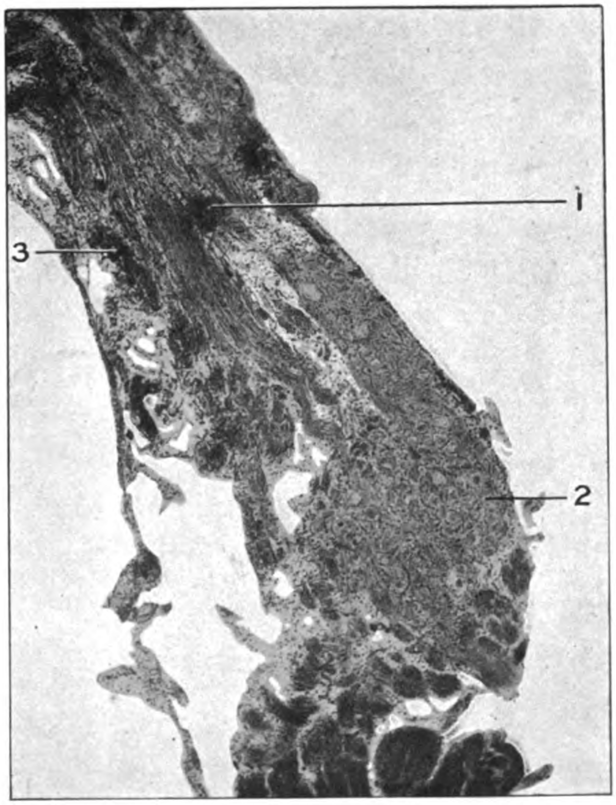

FIG. 14. (Case III.)

High-explosive shell injury of the ear. Horizontal section, No. 203, × 48 diam. (iron-hæmatoxylin). Shows hæmorrhage in vestibular nerve and normal condition of ganglion in the internal auditory meatus. 1 and 3, hæmorrhage between fibres of vestibular nerve ; 2, vestibular ganglion (normal).

Summary.

This case of high-explosive shell injury of the ear shows certain definite changes—viz., rupture of the tympanic membrane, slight hæmorrhage in the middle-ear spaces and in the fundus of the internal auditory meatus. The structures of the membranous labyrinth show normal conditions.

CASE IV.—INJURY TO THE EAR DUE TO THE BURSTING OF A RIFLE GRENADE.

The grenade burst close to the left side of this soldier and caused extensive general injury. (Rifle grenades, though much smaller than shells, contain a very powerful form of high explosive.—J. Fraser.)

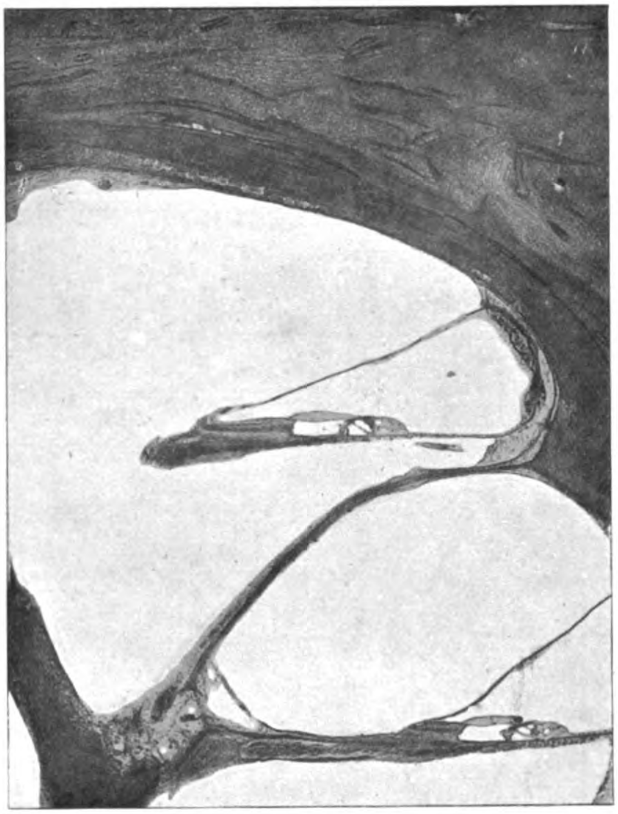

FIG. 15. (Case III.)

High-explosive shell injury of the ear. Horizontal section, No. 203, × 38 diam. (iron-hæmatoxylin). Shows condition of Corti's organ in apical and middle coils; except for the absence of the hair cells, due to faulty fixation of the specimen (?), there appears to be little change in the acoustic papilla.

Microscopic Examination.

Drumhead.—This is ruptured in the lower part posteriorly, but the edges of the perforation are for the most part glued together by blood clot (fig. 25).

Tympanic Cavity.—There is hæmorrhage in the marrow spaces, in the roof of the tympanic cavity, and there is a little blood in the tympanum itself in the angle between the drumhead and the malleus. The ossicles and the joints are normal, but there is slight hæmorrhage in the canal for the tensor tympani. On the inner wall of the tympanic cavity there is some effused blood around the geniculate ganglion. The structures in the oval and round windows are normal.

Labyrinth Capsule.—There is a small hæmorrhage in the fossa subarcuata, but otherwise the labyrinth capsule is healthy.

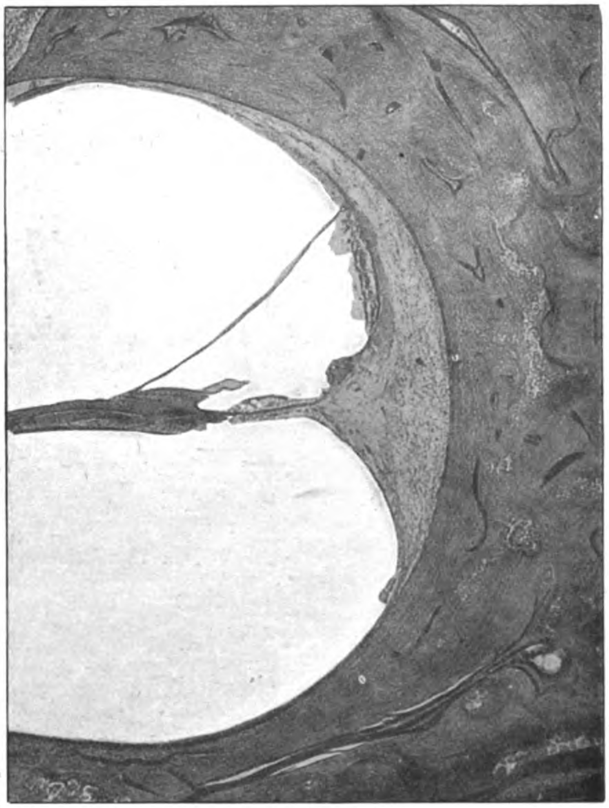

FIG. 16. (Case III.)

High-explosive shell injury of the ear. Horizontal section, No. 203, × 38 diam. (iron-hæmatoxylin). Shows normal (?) condition of Corti's organ in upper part of basal coil.

Labyrinth Contents: (1) *The Cochlea.*—The outline of Corti's organ is preserved, but many of the cells—not only the hair cells but also the supporting cells—have disappeared, so that Corti's organ appears rather like a ghost or skeleton. The epithelial cells of the stria vascularis appear to be detached from the spiral ligament in the basal and middle coils. There is blood in the scala tympani in the region of the round window,

(2) *Vestibule.*—The otolith membrane of the saccule is separated and the neuro-epithelium irregular. The aqueduct of the vestibule is normal.

(3) *Canals.*—The cupula of the superior canal is separated, but the ampulla of the posterior canal is normal.

Internal Meatus.—There is extensive hæmorrhage in the fundus of the internal meatus, and there is also some blood in the bony canal which contains the branch of the vestibular nerve for the crista of the lateral canal. There is also a considerable amount of blood pigment in the internal meatus.

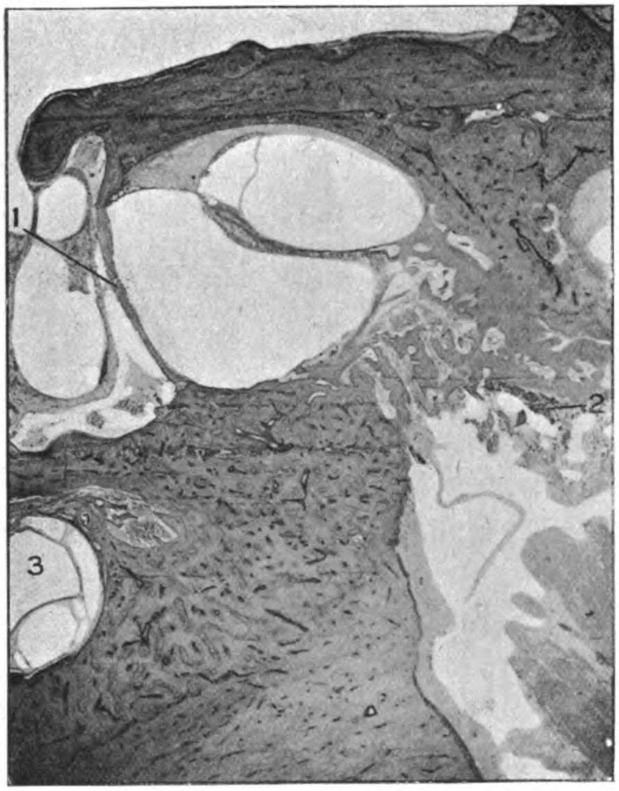

FIG. 17. (Case III.)

High-explosive shell injury of ear. Horizontal section, No. 265, × 11 diam. (hæmatoxylin and eosin). Shows region of round window and fundus of internal meatus with hæmorrhage. 1, Membrane of round window; 2, hæmorrhage in internal meatus; 3, ampullary end of posterior vertical canal.

(*See* figs. 18 to 24.)

Summary.

The changes in this case of ear injury due to grenade explosion are fairly definite and include a recent rupture of the tympanic membrane, the edges of which are partially glued together by fibrin. Further, there are hæmorrhages in the tympanic cavity, in the marrow spaces in the roof of this cavity, around the geniculate ganglion and in the fossa subarcuata. There is also bleeding in the scala tympani of the cochlea in the region of the round window. There is a marked hæmorrhage in the fundus of the internal meatus. The otolith membrane of the saccule is separated and the neuro-epithelium is irregular, while the cupula of the superior canal is also separated. Although the outline of Corti's organ is preserved, the hair cells and some of the supporting cells cannot be made out, so that the organ appears ghost-like. (These appearances in the neuro-epithelium of the labyrinth may possibly be due to post-mortem change,

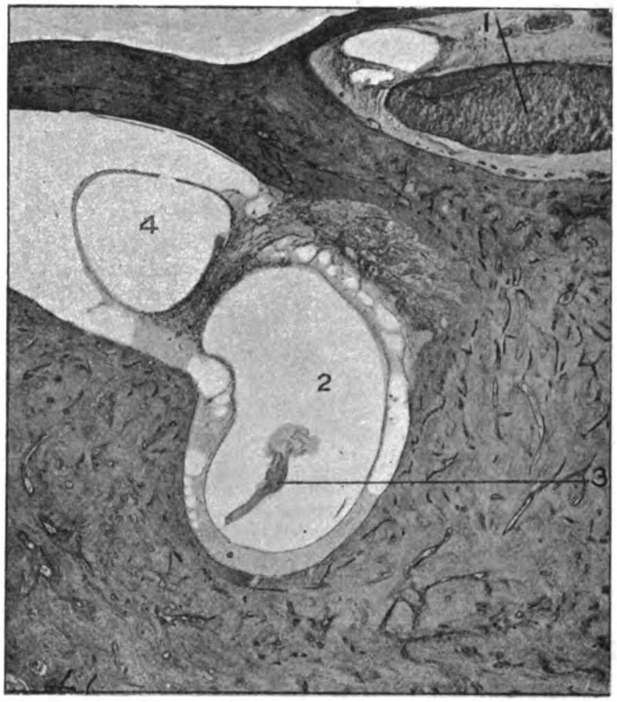

FIG. 18. (Case IV.)

Injury of left ear due to bursting of rifle grenade. Horizontal section, No. 125, × 14 diam. (hæmatoxylin and eosin). Shows crista of lateral canal and displaced otolith membrane of utricle. 1, facial nerve; 2, upper part of utricle with, 3, detached otolith membrane; 4, ampullary end of lateral canal.

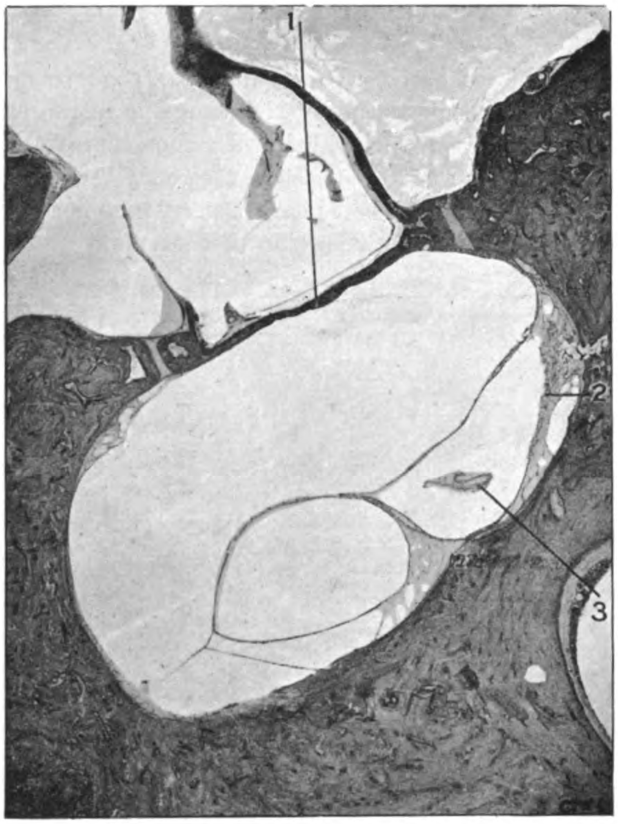

FIG. 19. (Case IV.)

Injury of left ear due to rifle grenade. Horizontal section, No. 225, × 14 diam. (hæmatoxylin and eosin). Shows oval window with stapes; displacement of otolith membrane of saccule; desquamation of neuro-epithelium. 1, footplate of stapes; 2, neuro-epithelium of saccule; 3, detached otolith membrane.

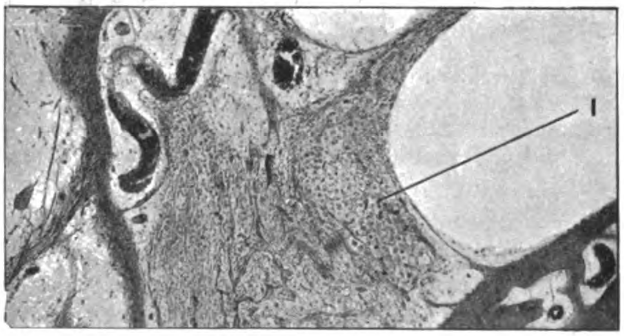

FIG. 20. (Case IV.)

Rifle grenade injury of left ear. Horizontal section, No. 230, × 48 diam. (iron-hæmatoxylin). Shows, 1, shrunken (?) condition of cells of spiral ganglion of middle coils.

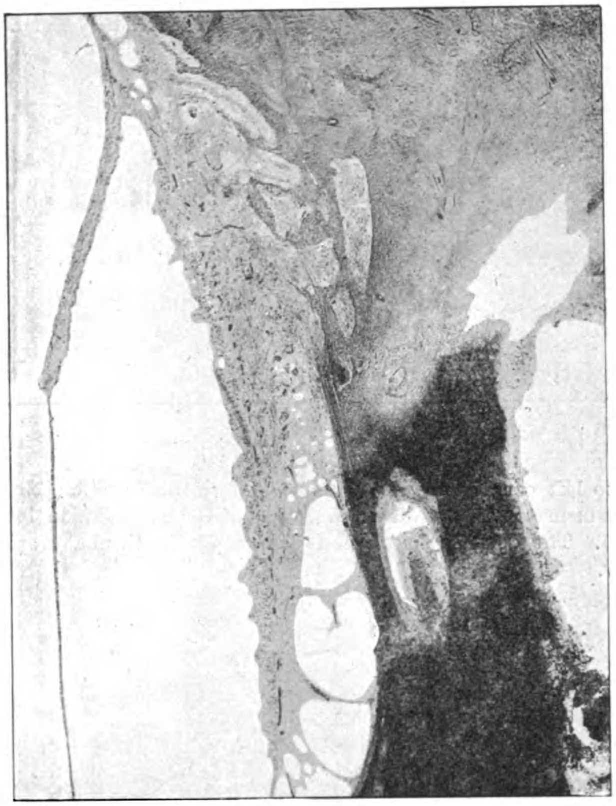

FIG. 21. (Case IV.)

Rifle grenade injury of left ear. Horizontal section, No. 230, × 48 diam. (iron-hæmatoxylin). Shows irregular condition of neuro-epithelium of saccule and loss of otolith membrane.

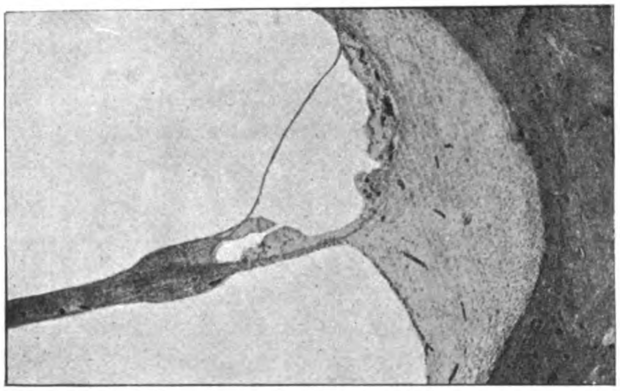

FIG. 22. (Case IV.)

Injury to left ear due to rifle grenade. Horizontal section, No. 230, × 48 diam. (iron-hæmatoxylin). Shows condition of Corti's organ in upper part of basal coil. The epithelial cells are irregular and do not stain well, and the stria vascularis is desquamated.

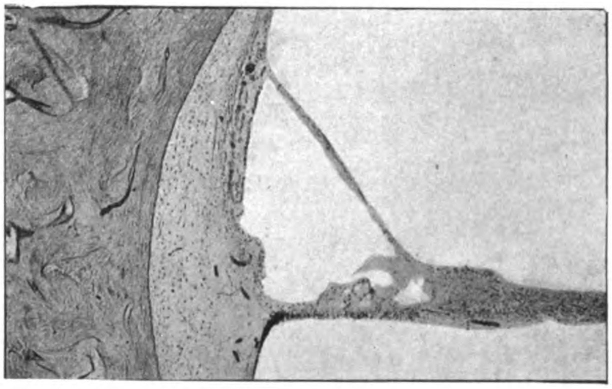

FIG. 23. (Case IV.)

Injury to left ear due to rifle grenade. Horizontal section, No. 230, × 48 diam. (iron-hæmatoxylin). Shows condition of Corti's organ in lower part of middle coil. The epithelial cells and the vessels in the bony spiral lamina stain badly.

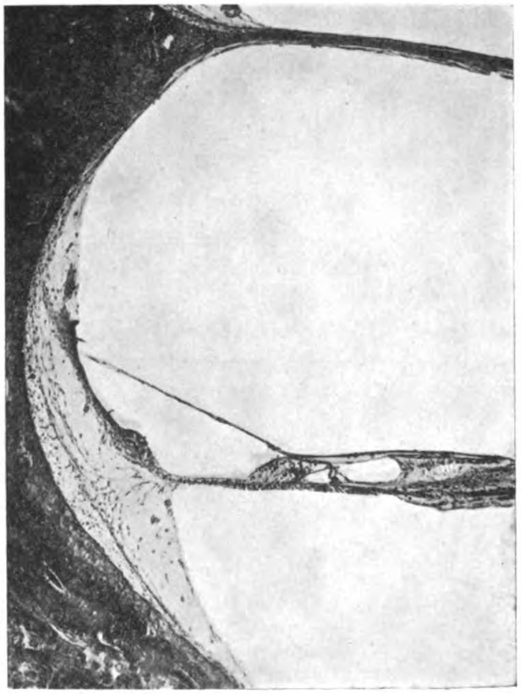

FIG. 24. (Case IV.)

Cochlear canal with Corti's organ from middle coil of cochlea in an old man aged 80, who suffered from nerve deafness. It will be seen that the acoustic papilla is well formed. (This specimen is shown for comparison with those obtained from Cases III, IV, V, and VI, in which the ears had been subjected to concussion caused by shell or rifle-grenade explosion.)

but in our opinion, they are more probably due to "degenerative neuritis" of the nerve structures of the inner ear.) In this case the stress of the explosion appears to have been exerted on the posterior inferior part of the drumhead, the region of the round window and the fundus of the internal auditory meatus.

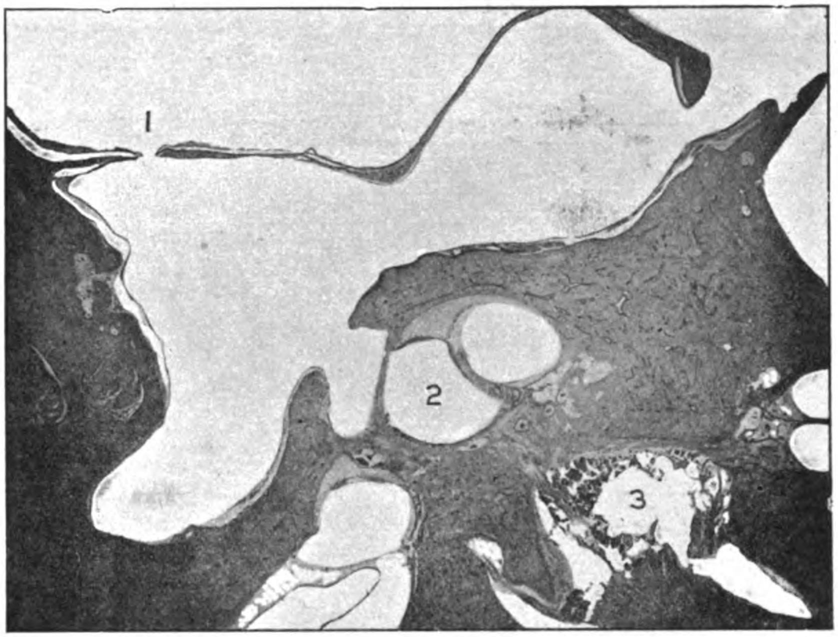

FIG. 25. (Case IV.)

Injury to left ear due to explosion of rifle grenade. Horizontal section, No. 305, × 9 diam. (hæmatoxylin and eosin). Shows, 1, rupture of drumhead with blood clot on anterior margin; 2, scala tympani just internal to round window membrane with thin layer of hæmorrhage on the walls; 3, fundus of internal meatus with hæmorrhage.

CASE V.—SHELL EXPLOSION.

The patient suffered from severe concussion and the right side of the head and body presented multiple wounds.

Naked-eye examination of the ear showed a plug of wax in the right external auditory meatus. The right drumhead appeared lustreless, opaque and indrawn after the wax had been removed.

Microscopic Examination.

The drumhead appears to be unusually thick, but is otherwise normal.

Middle-ear Spaces.—There is slight hæmorrhage in the tubal part of the tympanic cavity and on the inner wall of the middle ear. The tympanic ossicles and joints are normal. The footplate of the stapes shows a congenital dehiscence in the bone, filled with connective tissue. The niches of the oval and round window are healthy.

Hollow Spaces of the Labyrinth: (1) *Cochlea.*—There are small round masses of hyaline substance in the scala tympani and scala vestibuli, but these are probably of little importance. Corti's organ shows a normal outline in all coils. The hair cells cannot be made out, but this of course is not unusual in post-mortem specimens. The cochlear opening of the perilymphatic aqueduct is normal, but towards the cranial end the aqueduct contains a little hæmorrhage.

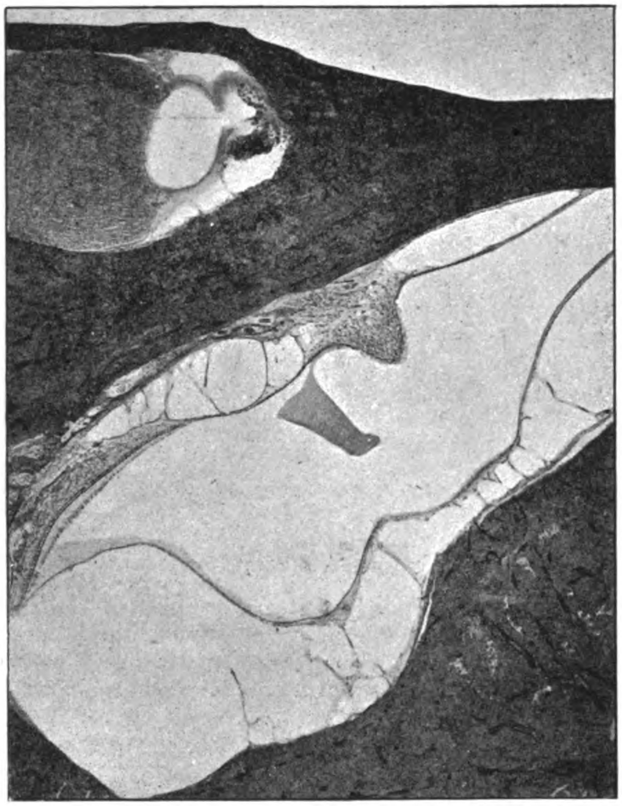

FIG. 26. (Case V.)

Injury (?) of right ear due to shell explosion (the right meatus contained a large plug of wax). Horizontal section, No. 95, × 19 diam. (hæmatoxylin and eosin). Shows displacement of cupula of lateral canal—artefact?

(2) *Vestibule.*—The otolith membrane of the utricle is raised up from the neuro-epithelial cells (artefact ?). The saccule and its otolith membrane are normal. The ductus endolymphaticus is healthy.

(3) *Canals.*—The cupula of the external canal is misplaced, as is also that of the superior canal; otherwise these canals are healthy. The crista of the posterior canal is healthy.

Internal Meatus.—The facial nerve is healthy. There is some hæmorrhage in the fundus of the meatus around the cochlear nerve.

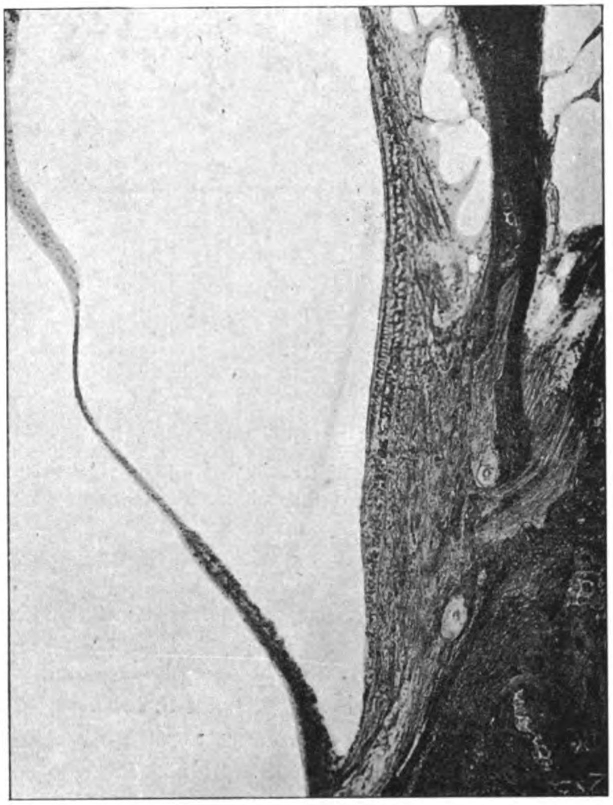

FIG. 27. (Case V.)

Injury (?) of right ear due to shell explosion. (The right meatus contained a large plug of wax.) Horizontal section through the vestibule. Shows the normal condition of the saccule with otolith membrane intact.

Summary.

The changes in this case are very slight. This may possibly be explained by the presence of a plug of wax in the external meatus. There are small hæmorrhages in the tubal part of the tympanic cavity, in the canal for the tensor tympani, in the cranial ends of the fossa subarcuata and perilymphatic aqueduct, and in the fundus of the internal meatus. The neuro-epithelium of the labyrinth shows little change, but the detachment of the otolith membrane of the utricle and of the cupulæ of the lateral and superior canals is worth recording. If a similar condition were found in the labyrinths of other patients who had suffered from shell explosion, these conditions might be regarded as of importance.

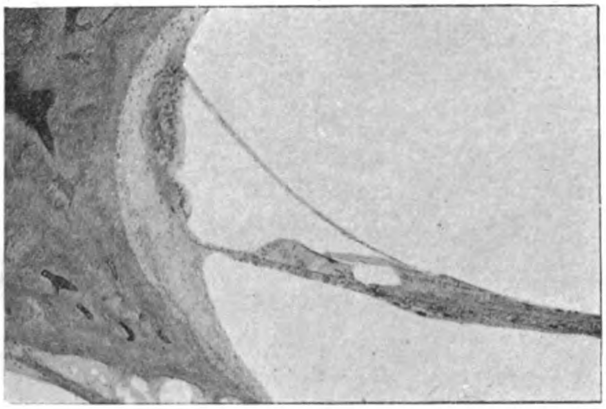

FIG. 28. (Case V.)

Injury (?) to right ear due to shell explosion. (The right external meatus contained a large plug of wax.) Horizontal section through cochlea showing normal (?) condition of Corti's organ in middle coil.

CASE VI.—INJURY BY HIGH-EXPLOSIVE SHELL.

This soldier caught the full blast of a high-explosive shell which burst close to his left side and shattered this side from head to foot.

Naked-eye Examination.—Left tympanic membrane shattered, only the outer margin remaining attached to the annulus. The malleus appears to be pushed inwards with a piece of membrane attached to it. The long process of the incus can be seen through the perforation. The inner wall of the tympanum presents a reddish-brown appearance, but there is little evidence of blood in the antrum. The superior canal appears normal when opened to admit the fixing fluid.

Microscopic Examination.

Tympanic Membrane.—There is a large gap in the drumhead in front of, below and behind the handle of the malleus, but there is no rupture of Shrapnell's membrane. The lower part of the handle of the malleus, with a piece of membrane attached, is in contact with the promontory.

Middle-ear Spaces.—The *Eustachian Tube* contains hæmorrhage. The head of the malleus is healthy and the joint between the malleus and incus is normal as is also that between the incus and stapes. The stapes footplate appears to be somewhat displaced and the posterior part of the annular ligament is ruptured (artefact ?). The posterior part of the footplate of the stapes is tilted outwards towards the tympanic cavity (artefact ?).

Hæmorrhage is present on the inner wall of the attic and also between the short process of the incus and the outer wall of the aditus. Free blood is also seen in Prussac's space. In the lower part of the cavity the inner wall shows a layer of hæmorrhage and the niches of the oval and round windows are full of blood. The lining membrane of the tympanic cavity is congested and slightly swollen. The sinus tympani also contains blood. The membrane of the round window appears normal.

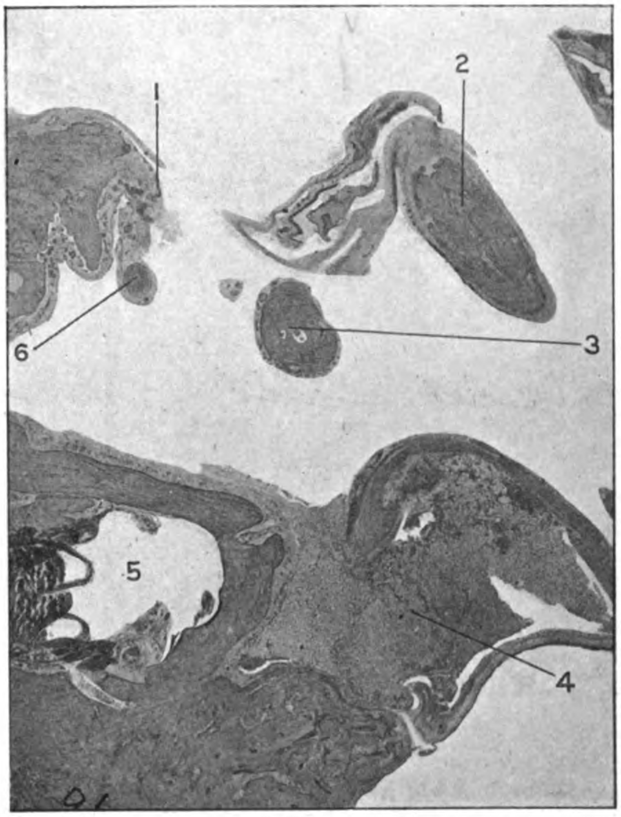

FIG. 29. (Case VI.)

Injury of left ear due to high explosive shell. Horizontal section, No. 285, × 15 diam. (hæmatoxylin and eosin). Shows rupture of drumhead in front of and behind the malleus. The niche of the oval window and the hollow of the stapes contain blood. 1, posterior part of ruptured drumhead; 2, malleus; 3, incus; 4, blood in hollow of stapes; 5, facial canal (the nerve is displaced—artefact); 6, chorda tympani.

Hæmorrhage is present in the cells in the roof of the antrum and in the border cells between the antrum and external meatus. There is a little free blood in the floor of the aditus.

Labyrinth Capsule.—There is some hæmorrhage in the canal for the great superficial petrosal nerve. The vessels of the fossa subarcuata are dilated.

Labyrinth Contents: (1) *Cochlea.*—Owing to a fault in the first embedding of the specimen, air entered the hollow spaces of the labyrinth, and in the second embedding the evacuation apparatus was used to extract the air. It is therefore impossible to speak with any degree of certainty regarding the condition of the nerve structures. The intravestibular and apical portions of the cochlear canal are more normal than the middle portions, but this may be due to the fact that the latter was more affected by the suction apparatus, which was only applied after the basal coil of the cochlea had been opened. The cochlear opening of the perilymphatic aqueduct is normal.

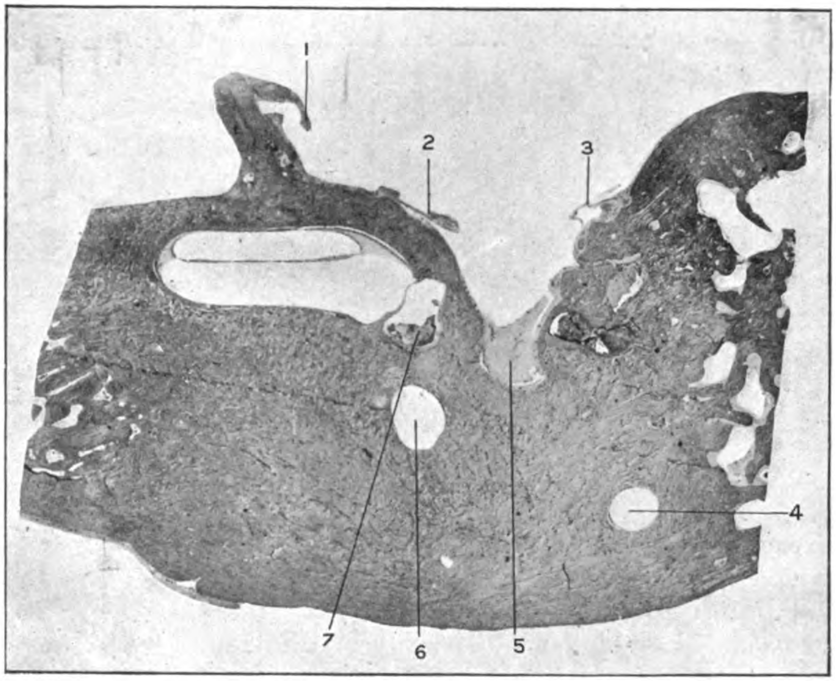

FIG. 30. (Case VI.)

Injury of left ear due to high-explosive shell. Horizontal section, No. 410, × 6 diam. (hæmatoxylin and eosin). Shows large rupture of drumhead. The central part of the membrane is in contact with the promontory. There is hæmorrhage in the niche of the round window. 1, anterior part of ruptured drumhead; 2, central portion of drumhead in contact with promontory; 3, posterior part of drumhead; 4, smooth end of posterior vertical canal; 5, blood in sinus tympani; 6, ampullary end of posterior canal; 7, blood in niche of round window.

(2) *Vestibule.*—The neuro-epithelium of the utricle and saccule appears healthy. The aqueduct of the vestibule is normal and the ductus endolymphaticus is quite healthy.

(3) *Canals.*—The superior canal is normal except that in the ampulla the epithelium is irregular (artefact). The cristæ of the external and posterior canals are normal.

The internal meatus and nerves show no hæmorrhage nor other abnormality.

Summary.

In this case the force of the explosion seems to have been expended in rupturing the drumhead, so that the structures of the inner ear, along with the nerves in the internal meatus, have escaped. Owing to a fault in the first embedding of the specimen, air was present in the hollow spaces of the labyrinth, and it is therefore unwise to be dogmatic as to the condition of the membranous labyrinth. The rupture of the saccule and of portions of the membranous cochlea are probably artefacts produced by the use of the suction apparatus. The rupture of the posterior part of the annular ligament may also be due to the same cause.

CONCLUSION.

The only changes of importance found in the four cases of "explosion" injury of the ear are: (1) Rupture of the drumhead (Cases III, IV, and VI) and hæmorrhage into the middle ear spaces; (2) hæmorrhage in the fundus of the internal meatus in three of the four cases. In Cases III and V the neuro-epithelial structures of the labyrinth appear to be normal. In Case IV the changes are possibly of "post-mortem" origin, but they appear to us to be due rather to an early stage of "degenerative neuritis," while in Case VI they are caused by a fault in the preparation of the specimen. It seems quite possible that in many cases of "shell" or "explosion" deafness we have to deal with a functional affection as suggested by Milligan and Westmacott. On the other hand, rupture of the drumhead and hæmorrhage into the middle ear spaces must cause a certain loss of hearing; while hæmorrhage in the fundus of the internal meatus may give rise to deafness, tinnitus, giddiness, and other symptoms of an inner ear lesion. It may be that the "blow" to the ear due to shell explosion, and the associated loud sound, paralyses the delicate nerve endings of the auditory apparatus, but we cannot claim to have demonstrated this microscopically, except possibly in Case IV. As we have already said, microscopic examination of the ears from cases of shell deafness, which die from other causes years after the injury, would be of great value in clearing up the pathology of the condition, and especially in throwing light on the question of "degenerative neuritis" of the cochlear apparatus.

The writers wish to thank Mr. Richard Muir for the photomicrographs which illustrate this paper. They also acknowledge a grant from the Carnegie Trust in payment of the expenses incurred in reproducing the illustrations.

Colonel BIRKETT, C.B.

I cannot offer any suggestions on the discussion which has been opened by yourself, but I think that perhaps Dr. Gordon Wilson, who has been making a special study of this work, may have a great deal more to say on the subject than I can. The number of ear cases in our hospital, which contains 2,000 beds, is very great: I have a ward of seventy-five beds set apart specially for eye, ear, nose and throat cases. The class of ear cases which presents itself there is very largely the chronic suppurative variety. We do see a large number of cases of rupture of the tympanic membrane following high explosives. As to the situation of these ruptures, it has not seemed to me that there is any particular predominance of any one site. What we have noticed, and what we have tried to impress on the authorities there, is that interference with these ears, in the first place, should not be carried out at the Front. The patients nearly always come down with a history of having had the ears syringed. Last July, when we had these cases early, they came to us without having had this interference. We could then take care of them from the first, and we treated them as you suggested, Sir, and the result has been a satisfactory healing in the majority of cases. Where the rupture has been of considerable duration I found that nitrate of silver, 25 gr. to the ounce, applied to the edges of the rupture, stimulates the healing of it, so that in from six to eight weeks there has been complete closure, with marked restoration of hearing.

As to the psychical cases, they are, perhaps, the most pathetic we have to deal with. These men are broken in spirit, and their nerves are entirely shattered, and this condition is nearly always associated with mutism. It is, therefore, impossible to get any accurate results from our tests. We begin by encouraging these men to hear and speak. Often, however, those methods do not succeed, and then we try to shame the men out of their disability before their companions-in-arms. Sometimes those means are successful. One method was letting off an alarm apparatus suddenly: this shook one man so much that he eventually heard. I have nothing new to say about the subject, or anything to add to the pathology.

Dr. Gordon Wilson.

It has been my good fortune, during the last six months, to be associated with the Canadian Hospital at Folkestone, and I have had many cases of deafness associated with labyrinthine troubles; I have records of over 100 cases of nerve deafness. Recently I was sent to France to see recent cases of concussion-deafness there. I have not yet had time to examine my specimens, but I hope to do so when I get back.

We divided our cases into three groups: (1) nerve deafness; (2) cases of men with what we call a fixed idea that they cannot hear; (3) malingerers. Rupture of the drum may take place at any part of it; I have seen several cases involving the membrana flaccida: in one case it was driven in against the promontory, with complete rupture of the drum. In France it was curious to note how many of the men had no hæmorrhage from the ear, because, it was said, the injury had been so slight. While I was at the Ypres salient and on the Somme I probably saw 250 cases of shell shock. Only fifty of those complained of deafness, and of those fifty only seventeen had actual nerve deafness, a very small proportion. But at that time things were quiet on the Somme—at the end of December and in the month of January.

With regard to the cases with a fixed idea, rapid recovery occurred under hypnotism. Some of the cases recover if cold water is run into the ear. We never use the electric current, because if we do the result is an irritation of the vestibular nerve, and the production of intense vertigo.

With regard to the treatment of our cases, we ascertain whether the labyrinth has any activity in those in which there is complete deafness on one side or both. In all the cases we had at Westcliffe there was none in which mutism was not present, and all of them had been under otologists for periods ranging from two to twelve months, and had been sent to us at the end, particularly Canadians. We first run cold water into the ear, and get a caloric reaction. If we do not get that we do not trouble. If we do we proceed, always using tuning forks. If we use the C, or the C_1 fork against the ear, we may not get a reaction, but by using both, and thus having a summation of stimuli, we get it. In totally deaf cases we proceed to use resonators. We get tubes like speaking-tubes in the ear. All this will be published in full later.

One thing which has interested us very much I would like to mention.

We have had cases of wounds of the cerebellum, and the question has arisen in connexion with the differential diagnosis of labyrinthine disease from cerebellar tumour. It has been our good fortune to keep some of our cases under observation for several months, and we have been able to show that pure cerebellar injury results in a form of nystagmus which is different from that found in association with labyrinth cases. I need not proceed to tell you how that is the case. I was very pleased to see Colonel Gordon Holmes when I was in France, and to learn that he had a large number of ward cases which bore on that fact. There is nothing more important in connexion with the ear than to be asked the question: Is that a cerebellar case or is it the beginning of a labyrinthine case? I think the war records will show that some of our most difficult cases of cure have been those in which a missile has cut the facial nerve outside the ear, or in which there was complete deafness which we could not touch at all. When I was in Paris I was much interested in noticing that the same thing may be said of the war experience in France. I wonder whether anyone has noticed, in the deaf cases following trauma, a peripheral limitation of the field of vision as well as a peripheral limitation of hearing.

Mr. C. E. West.

I have found exactly the same thing as the last speaker just mentioned—namely, that the auditory field is contracted at both ends in these cases, and more or less symmetrically. I do not know whether in many cases the speaker found contracted visual fields as well. [Dr. Wilson: Yes.] The analogy of the two struck me so much that I use it as a metaphor in teaching.

I have seen comparatively few cases of direct injury of the ear while doing my war work, and that has surprised me. There have been a certain number of injuries of the pinna, cicatricial contraction, and so on, but they have been of no particular importance. Generally, the collateral injuries are so much more important that one has to relegate the question of the ear to a secondary place.

One group of cases has struck me particularly—namely, glancing wounds of the temporal region about the ear without fracture, apparently a scalp wound only, but with the pericranium involved. In each one of those cases there was gross labyrinthine deafness. I saw, this afternoon, a gentleman who, years ago, had been shot at by a Dacoit in India, and received an exactly similar wound, and had just the same deafness on one side—in each case the same side as the injury, the other ear not being affected at all. How far it is permanent we do not know, because we have not the opportunity of following out indefinitely the cases which occur in the War, but the deafness is prolonged.

And we come across a large number of people who are said to be suffering from explosion deafness and who, manifestly, are suffering from continued old chronic middle-ear suppuration without labyrinthine deafness or symptoms, or who have discovered, as the result of their own overhauling, after being blown up, that they have middle-ear deafness and are attributing it to shell shock. A large proportion of the cases I have seen have been of that sort.

Another interesting thing is that there is a fashion in shell-shock effects. In the earlier days of the War there were a large number of cases of pseudo-labyrinthine deafness — people who recovered spontaneously or under some form of suggestion. Recently, at the First London General Hospital, these have been practically absent, and in their place there has been a stream of aphonics. I think these are largely due to suggestion: if a man thinks he will be rendered voiceless by being blown up, he is found to be so if he encounters that accident. With regard to people who, apparently, have true labyrinthine deafness, I do not know whether other surgeons succeed better, but I am hopelessly in the dark in regard to prognosis in these cases. A large number appear to recover almost completely, and the majority seem to get back useful hearing, slowly and gradually. A certain proportion of them seem to make no recovery. If anyone can tell me any bases for prognosis I shall be very grateful.

Dr. DUNDAS GRANT.

Like Mr. West, I have been surprised that we do not see more cases of clear-cut labyrinthine injury. A large number of them consist of very ordinary cases of chronic suppuration or chronic catarrh, down to mere impacted cerumen. But there are many about which certain generalities may be stated.

My experience has been the same as that of our President and others: that where the membrane has been ruptured the involvement of the labyrinth, as a rule, has been very slight, in some cases the labyrinth has even escaped, though one of Mr. Fraser's sections seems to disprove that. That case appears to be an exceptional one.

I should like to know whether many members have seen what I should call an "in-driven" membrane. I have seen a few in which the membrane has been driven in and so closely related to the ossicles that the appearance was as if the ossicles were sculptured out, just as in an extreme case of relaxed membrane. In these cases the margin of the tympanum has been well defined.

With regard to the question whether a perforation with suppuration is recent or of old standing, or whether it is a recent traumatic rupture with subsequent suppuration, I think the best guide is the condition of the Eustachian tube. If it is quite patent, it is reasonable to think a traumatic injury of the drum is a recent one. If the suppuration has continued a long time and the Eustachian tubes are not very patent, it is impossible to say from this whether it is a chronic case or a traumatic rupture.

With regard to prognosis, of course when the caloric test is negative, the prognosis is probably at its worst. Another point is the upper range of audition, for when that is considerably lowered, the prognosis, as a rule, is bad. When that upper range is fairly well preserved, the prospects are good. I have gathered some statistics from thirty-one cases in which it has been tested. It was normal in twenty-five of them, there was slight lowering in three, and very considerable lowering in the remainder. In those in which it was preserved, the improvement was marked or very considerable. But in one case, at all events, in spite of that upper limit being preserved, there was no improvement, and it was found that there was a slow reaction to the caloric test. There were four cases in which the upper limit was preserved and there was no improvement.

With regard to the cases of deafness, a number of them came with the complaint of "deafness," some of them had nerve deafness, and the question arose as to whether there was nasal obstruction. I thought I should find it in a large number. Of fifty cases there was marked deflection of the septum in eleven, but thirty-one had nothing of the sort. Four had adenoids. Not all the cases of deflected septum caused any considerable obstruction.

With regard to the caloric tests, I would remind you of the apparatus for producing cold in the ear which I have before exhibited to the Section, and which has apparently been taken up by the Army otologists in France as a regular official test. It is a tube of copper, covered with a little cotton moistened with ethyl chloride. A current of air is driven through it, and as soon as it is at its coldest, as tested on one's own cheek, the patient's head is thrown back at an angle of 60° and he is told to turn his eyes to the opposite side, when nystagmus should be produced in from twenty-eight to thirty seconds. This obviates the dangerous practice of injecting cold water into the ear, in which a perforation may already exist. It has also been taken up by Moure in Bordeaux. The point through which the air enters the tube should be very small, otherwise the current is jerky. Dr. Paterson, of Cardiff, said it would be a good thing if we had an equally portable apparatus for making the hot test. I show you an apparatus which will do this very quickly. Mr. Clayton Fox has helped me in testing many cases, and we find we get nystagmus to the same side in about fifteen seconds. Possibly some members may devise an improvement upon it. Perhaps the bottle might contain a saturated·solution of sulphate of soda, which is heated, and allowed to solidify again, and heat thus generated. In cases in which you wish to get nystagmus to the same side rather than to the opposite side—there being one in that direction already—this solves what has hitherto been a problem.

With regard to the cases of psychical deafness, much can be accomplished by re-education. You get them to hear a simple vowel, but you must not worry them too much, or you will throw them back into their nervous state. I do not think Colonel Birkett drew a line of demarcation between psychical deafness and simulated deafness. No doubt the reason he has not done so is that there is no hard-and-fast line: there are so many cases which blend both. I had the case of an officer who said he was quite deaf. We tried the noise machine, and he rose to it at once. That might be called simulated, but I think it is psychic, because he had not been a neuropathic, but had been so shaken up that he was reduced to the extremity of exaggerating his complaint, which he had only in a mild form, and which probably existed when he was "buried." It passed off. I think the majority of the psychical cases have no simulation about them. A test which helps us is the pupil reaction. We know that any sensory stimulus will cause dilatation of the pupil; for instance, while the pupil is carefully observed, we blow a whistle, or, in an extreme case, a motor-car hooter behind the patient, and watch for dilatation of the pupil. But though a man may rise to that, it does not necessarily follow that he is shamming. To test it with success, we must have the pupil contracted by light, and see whether it dilates on the sound being produced.

I should like to put two questions, which I do not feel equal to anwering myself: (1) What is the degree of deafness which justifies us in looking upon a man as being ineligible for general service? We see how one man who cannot hear the watch makes progress, while another may be very stupid. Is there any standard? I am thinking of listening-posts. The second question is, what are we to do with those who have suppuration of the middle ear? Must we send them to the Front or not? My friend Mr. Kisch, who was in Boulogne for a long time, said that no man who had even had a radical mastoid operation should be sent to the Front. But I think that is carrying it too far. I showed a case, about sixteen years ago, in which I had preserved a cholesteatomatous membrane. The patient disappeared until last year, when he came back as a stalwart sergeant, who had been all through the War, and it was only discovered that he was deaf in one ear when he got injured in the other. Another case was that of a boy whom I showed here, who had suppuration of the middle ear. I opened a cerebellar abscess and the bulb of the jugular vein. He has been eighteen months in the War as a driver of the R.F.A.

I have spoken at this length about these things because there are some cases about which I feel a difficulty, and I shall be glad if other members can help me.

[Major SHUTER: Was the upper limit of audition taken by Dr. Grant by air conduction, or by bone conduction? And with what instrument?]

Dr. DUNDAS GRANT: I take it with as good a specimen of Galton's whistle as I can get—the original whistle. It does not go as high as the monochord. I exclude as far as possible the function of the opposite ear. It indicates the hearing for a closed pipe of so many millimetres in length, and if the hearing is 1·5, 1·8 or 2, I pass the case as one of good preservation. I think that whistle is sufficient for all clinical purposes.

Dr. C. E. JONES-PHILLIPSON.[1]

I hope I may be permitted a few remarks as one who has looked after the ear cases for the Third Army, having been doing that work for nine months. I had the good fortune to be located at Stationary Hospital No. 12, where the Surgeon-General concentrated ear work, allocated forty-four beds (indoor), and gave out-patient accommodation for eighty. All the work of the Third Army was passed through this Department, and I made notes of 1,172 cases examined during that period. As will be seen from the abstract I analysed 100 cases of war injury of the ear, in which there were thirty-one cases of lacerations. I saw all my cases within twenty-four to thirty-six hours of their coming out of the trenches, some on the day of receiving the wound. A previous speaker, and a part of the President's address, laid no particular stress on the site of the laceration, but from my cases I regard that as very significant. In thirty-one cases the laceration occurred in the anterior-inferior quadrant in twenty; in the postero-inferior quadrant in six; in the inferior quadrants—i.e., between the two—in one; in the umbo in two; in the posterior quadrants across the two in one; in the antero-superior quadrant in one. It has also been asked whether any note had been made of rupture of the membrana flaccida. I had such a case, which is noted under the head "blood in the middle ear." No. 31 had a ruptured membrana tympani in the antero-superior quadrant, high up. There was a slow oozing of sero-sanguineous discharge for several days. Patient went to the base shortly after, and I thought it possible he had a fracture through the tegmen. He also had pains in the back of his neck and over the mastoid, and his face had been well peppered with fragments. I had four other cases of distinct blood-clot in the middle ear. In the case mentioned it was with rupture of the membrana tympani, in another without. The patient volunteered the information that he could taste blood in his mouth, and I thought it came through the Eustachian tube; I could not see it by posterior rhinoscopy.

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[1] Late Medical Officer in Charge, Ear, Throat, and Nose Department, Third Army No. 12 Stationary Hospital, British Expeditionary Force.

Many also volunteered the information that they were knocked out or were unconscious, some remaining so for one or two hours. I had this verified in many cases. After this state had passed off the men were in a dazed condition, and often could not walk unassisted. The more profound cases had lost the power of speech, and two or three of the cases could not see. The major conditions often passed off fairly quickly, leaving dizziness and giddiness, which lasted for a long time. These cases I examined with great care. I found they showed a horizontal or rotatory nystagmus on turning the eyes to either side; I do not mean on turning the eyes to the extreme degree permitted by the orbit, because it will be produced in anyone by that means. In this connexion I instance cases No. 23, 47, 48, 52, 56, 78, 83. It should be noted which side was most affected by the explosion. When it occurred on the parapet in front of the patient, he has a double, right and left, spontaneous horizontal nystagmus, or right or left according to the side affected.

One more little matter I would like to bring before you has reference to caloric tests. They require very much more water to prove a functionating or non-functionating labyrinth in the cases at the Front than in civil life, because these ears have been profoundly disturbed. You cannot tell whether a labyrinth is functionating unless you continue your test with hot or cold for three times as long as normal. In only two of my cases out of 100 did I find the caloric test brought no response—namely, Nos. 85 and 86. In these two cases I used as much as two and three quarts of water; they had intact membranæ tympani. Those were the cases which were most profoundly affected, both in regard to tuning-fork reactions and in response to the caloric test. The nystagmus varied—it was definitely "there" in all except Nos. 85 and 86—often very quick and feeble or very slow and feeble. In one case the nystagmus was very coarse, only comparable with the movements of the pendulum of a big clock—slow, with long excursions. In a few the nystagmus was quickly induced and very violent. The patient looked deadly pale, with extreme giddiness, faintness, and vomiting; in two the effect was so prolonged that the cases were unable to return to the ward for fifteen to twenty minutes.

With regard to movements produced by caloric tests, I do not wish to be understood to say that every case requires to be tested with a large amount of water to prove function of the labyrinth, but some labyrinths are profoundly depressed by the concussion, and are only slowly responsive. There are cases in which there is extreme activity, as in that of the lieutenant I have mentioned.

AN ANALYSIS OF 100 CASES OF WAR INJURIES OF THE EAR.

The War has afforded the opportunity to further the knowledge of injuries to the internal ear. Many obstacles are in the way, and much valuable information will not be recorded.

(1) Many cases were not examined owing to the severity of other injuries; these were principally head cases under the care of surgical specialists, and one was reluctant to propose an examination and do the necessary tests, which might have produced disturbance and perhaps have retarded the progress of the case.

(2) Post-mortem evidence of damage to the internal ear might have been found, but these evidences would have been unaccompanied by definite symptoms complained of by the patient, as these cases were nearly always comatose.

(3) The transfer from firing line to base, and base to England, often quickly and always unexpectedly carried out, prevented me from repeating tests at intervals, and I was seldom able to watch a case for longer than fourteen days.

(4) The difficulty in tracing these cases later and in obtaining anything of value in the replies when obtained.

(5) In a hurriedly recruited army large numbers of men start military life as practically deaf men, and the increased loss said to be due to shell concussion can never properly be gauged.

External Ear.

Various degrees of laceration of the external ear are commonly seen—slits, perforations, or nearly complete severance of the auricle. They healed well and quickly. Two cases of severe perichondritis of the auricle with abscess formation were seen. Three cases of external ear injuries are here recorded showing no middle or internal ear damage.

(1) Private R. R. Cleaning up a billet by sweeping rubbish into a fire, a cartridge was swept in and exploded. A portion of the "fang" of the cartridge case went into the external auditory canal and was impacted there. There was no injury to the membrana tympani—merely an abrased canal.

(2) Private H. R. Bullet entered at the posterior border of left mastoid process, say ½ in. from tip, above and behind it; opening seen in pharynx about 1 in. to mesial side of posterior pillar of left fauces, passed obliquely across the nasopharynx, striking posterior end of right middle turbinate and out of right eye. Right antrum was full of blood and right eye destroyed.

(3) Private P. W. P. An aerial torpedo burst and wounded him deeply at the back of the neck, behind right ear and lower jaw. Wound extended from the base of right mastoid process to centre of right sternomastoid—posterior five-sixths of origin of right sternomastoid destroyed—anterior one-sixth remains. Recurrent paralysis of right cord, complete paralysis of right half palate; affection of lower half of facial, and of cervical and brachial plexus; X-ray showed fragments of shell deep down against cervical vertebra.

Notes of over 100 ear cases were made of patients who definitely attributed their deafness or increased deafness to the effect of "guns," "explosions," "bombardment," "being buried." An examination of the ears, nose, and nasopharynx was made in each case. Seventy per cent. of the cases examined showed pre-existing ear, throat and nose conditions: defects due to otitis media suppurativa, 34; defects due to C.D.C., 22; defects due to nose and nasopharynx, 17.

In no case was the nasopharyngeal airway considered faulty or worth noting unless it was a distinct abnormal condition as shown by nasal obstruction, due either to deflected septum plus turbinate hypertrophy —hypertrophy of the turbinates alone—adenoids alone or in conjunction with one or other of the former, and could be considered as a predisposing cause to a diseased condition of the ear.

It is my intention to compare the effects of explosion on the membrana tympani, middle ear, and internal ear: (1) In normal conditions; (2) in diseased and predisposing conditions.

Lacerations of the membrana tympani were seen in thirty-one cases: in normal conditions, fifteen; in diseased and predisposing conditions, sixteen.

Lacerations in pre-existing conditions are accounted for as follows: Conditions of nasal obstruction, three; conditions of otitis media suppurativa, healed by scar, five; conditions of C.D.C., four; conditions of nasal obstruction and adenoids, one; conditions of nasal obstruction and otitis media suppurativa, one; conditions of otitis media suppurativa, with loss, one; conditions of adenoids, one.

Site of laceration in total number of thirty-one cases: anterior inferior quadrant, twenty; posterior inferior quadrant, six; inferior quadrants, one; umbo, two; posterior quadrants, one; anterior superior quadrant, one.

Laceration of membrana tympani: (*a*) intact membranes, twenty-four; (*b*) with loss or scar, seven.

Hæmorrhages into membrana tympani (intra-membranous): (*a*) intact membranes, sixteen; (*b*) with loss or scar, six.

Lacerations were irregular, tears or flaps. Their edges were always swollen and red. They did not heal well in the large majority of cases. The edges or much larger portions sloughed, especially when the laceration was flap-like. Many cases were seen within twenty-four to thirty-six hours of the damage. The parts were gently syringed with lot. bor.—or lot. hydrogen peroxide — 10 vol. solution diluted four times with hot water, and a hot alkaline nasal wash prescribed. The surrounding ear parts were painted with tinct. iodi and 3 or 12 per cent. glyc. acid carbolic drops into ear, calomel, mist. alba and the patients were kept in bed.

A subacute or acute otitis media, followed by suppuration, was present in the majority. When we know that very few wounds received in this war heal by first intention, such healing cannot be expected in ear cases, which are extremely dirty in the majority of cases. Intra-membranous hæmorrhages frequently sloughed and led to similar conditions.

Blood in the Middle Ear (*vide* Nos. 39, 56, 60 & 76).

Four cases of firm blood-clot in the middle ear were seen, bulging the membrane outwards. In one instance the membrane was quite intact, the clot could be distinctly felt, and the membrane bulged over it as three air bulbs. In two of these cases the patient reported that blood came into his mouth, and that he could taste it, but it was not observed by posterior rhinoscopy.

No. 39.—Private T. L. Deafness since childhood; running ears; had acute pain in left ear. When on the battlefield he was in charge of the water-cart, and slept only 10 yards from the big guns. He complained of increased deafness and pain. There was blood-clot in the right posterior quadrants, and the left membrana tympani appeared as three air sacs covering a blue blood-clot; no perforation nor discharge, and it could be felt by a probe.

No. 56.—Private G. L. Had running ears when a child. Trench mortar shell burst near him and he was buried. Head became very giddy, with singing noises; he was like a drunken man; had staggering gait which passed off. On the right there were three intra-membranous blood patches; on the left a laceration, posterior inferior quadrant, and the middle ear was full of blood-clot. There was a very marked spontaneous horizontal nystagmus to left and also to right. His labyrinth right and left was hyper-excitable; his responses to the rotatory and caloric tests to right and left were easily produced and were normal but exaggerated. The tuning fork C_1 could not be heard by air conduction and was shortened negative right and left. Fork C_2 shortened negative right and left. Fork C_4 very short right and left.

No. 60.—Gunner S. S. A "Minnie" exploded 20 yards to the left of him causing deafness in right and left ears, and noises and discharge of blood from the left. On the right there was a flap laceration, anterior inferior quadrant of the membrana tympani; the left was bulged, bluish-red. There was a middle-ear blood-clot, and a laceration at the anterior inferior quadrant. The labyrinthine tests, rotatory and caloric, were both feeble. C_1, C_2, C_4, forks were all shortened, very short on the left.

No. 76.—Private H. B. Was cleaning the trench boards in a stooping position when a shell burst over him. There were shrapnel wounds of the face. He complained of left deafness; bleeding; giddiness; fainted at the time. On the left there was a laceration at the anterior inferior quadrant, an intramembranous hæmorrhage, and blood-clot in the middle ear. The rotatory tests produced a very brisk after nystagmus. The caloric tests right and left gave normal response, but hot irrigation of the left ear produced the tendency to fall to the right; hot irrigation of the right ear the tendency to fall backwards; patient became very pale and vomited violently. C_1, C_2, C_4 all heard short right and left, especially C_4. Weber to right.

In No. 31, with ruptured membrana tympani in anterior superior quadrant, high up, there was a slow oozing of sero-sanguineous discharge for several days (August 13, 1916, to August 21, 1916). He went to the base on August 22, 1916. I thought he possibly had a fracture through the tegmen tympani. He had, in addition, pains in the back of the neck and over the mastoid; his face had been well "peppered."

In No. 63 the left membrana tympani was bluish-red. Laceration at site of inferior quadrant; strands of tissue could be seen crossing the laceration; blood was exuding. The right membrana tympani had a calcareous patch at the same site. This may be an instance of a calcareous patch, the weak spot of a diseased membrane, having been driven in by the force of explosion.

The frequency of the complaint, "recurrence of discharge following shell concussion" in old conditions of otitis media suppurativa which have been dormant for years, seems more than a coincidence. The discharge in these recurrences, and following recent lacerations, was noticed in most instances on the third day.

Analysis of Symptoms.

In order of frequency :—

(1) Deafness, increased deafness, "dullness in ears."

(2) Noises in great variety (singing, buzzing, hissing, straining, thumping, bells, throbbing, ticking).

(3) Giddiness, dizziness, "dazed."

(4) Pain—soon passing off.

(5) Bleeding, at the time, or noticed soon after.

(6) Staggering gait, inability to walk, unconscious, dumbness, blindness.

Deafness was very marked soon after the explosion, always most on the side exposed to the full force; when the shell burst in front or behind a patient, both ears were affected. Patients who had been buried seem to have suffered more than others. The initial degree of deafness following the concussion soon passed off. The noises were often noticed only later, after the first degree of deafness had passed off. It was not often that increase in deafness was stated; as a rule, only the addition of noises to the previous condition. When the hearing showed further marked improvement, the persistence of the noises was a common complaint. Some patients reported being unconscious for from one to two hours; then feeling in a dazed condition, inability to walk unassisted, staggering gait; others that they lost the power to speak, or could not see. All these maximum conditions appear to pass off quickly; the lesser conditions, giddiness and dizziness, were complained of for seven to ten to fourteen days—anyway while under observation. These cases showed a horizontal or rotatory nystagmus, or turning eyes to the right or left. It must be noted whether both right and left sides were likely to have been affected at the time, or right or left only. It will be noticed that when both sides are affected there was a nystagmus to the right and left, when one side was affected there was a nystagmus to the opposite side. (*Vide* Nos. 23, 47, 48, 52, 56, 78, and 83.)

Spontaneous Nystagmus.

In the following seven cases giddiness and dizziness were complained of:—

No. 23.—Rifleman F. J. S. This man has old losses of right and left membranæ tympani. He complained that gunfire caused extreme giddiness, followed by sweating and vomiting. He had a horizontal nystagmus on right and left sides. The rotatory and caloric tests showed a hyper-excitable condition of the right and left labyrinths. The forks were not badly heard. Rinne was negative right and left for C_2, and C_4 was normally heard right and left.

No. 47.—Private A. W. Deaf since a child; slept near the guns. The continual noise increased his deafness and caused buzzing noises and giddiness. He had a horizontal nystagmus right and left. Tuning forks C_1 and C_4 were shortened, C_2 practically normal.

~~No.~~ 48.—Private M. Y. Had gunshot wound in right leg due to bomb explosion; deafness on left, straining noises, and giddiness. His membranæ tympani showed a condition of chronic dry catarrh. There was a rotatory nystagmus to the right. All the tuning forks were shortened on the left; Weber to right.

No. 52.—Lieutenant B. C. A. High-explosive shell burst a few yards from him, over him but more towards his left; he was stunned. Deaf right and left, noises in the head and pain for thirty-six hours. Both membranæ tympani were red. No sign of pre-existing disease. He has a spontaneous rotatory nystagmus to the left and horizontal nystagmus to the right. The rotatory and caloric tests showed a hypo-excitable condition of the labyrinth on right and left, the response was only a feeble one. The tuning forks for C_1 and C_4 were much shortened, C_2, although short, much less so in comparison. At the end of a week the right and left nystagmus had gone, C_1 and C_2 were now very slightly shortened; C_4 was still very short. The noises were much less, but present; giddiness had passed off.

No. 56.—Previously mentioned.

No. 78.—Lance-corporal J. B. A shell burst about 4 ft. from him, made him light-headed, and deaf in both ears. Was very giddy. Deafness to a large extent passed off. There was a laceration in posterior quadrant and discharge of pus, which had come on since the explosion five days ago. There was a horizontal nystagmus to the right and left. The tuning forks C_1, C_2, C_4, were all heard better on the right; on the left they were all short. Weber lateralized to the right.

No. 83.—Private C. B. Increased deafness, following the bursting of a shell twenty yards from him: previously deaf for years. There was a loss of membrana tympani in the left, and the membrane was red. The right membrana tympani was intact. Spontaneous horizontal nystagmus to right and left. The rotatory test to the left was normal; rotatory to the right, exaggerated response. Caloric to left normal; caloric to right, feeble response. All the forks were heard short on the left.

In the following cases the symptom giddiness was not complained of; two complained of feeling "dazed." In all a nystagmus was present. I regret in many instances I omitted to record whether a nystagmus was present. In "Experimental Physiology of the Semicircular Canals in the Dog-fish,"[1] the following statement appears: "Pressure on an ampulla causes movements of the eyes and fins such as would occur normally if the animal's body were rotated in the plane of the canal stimulated." Consider also the rotatory test, which is mechanical stimulation of the ampulla.

No. 40.—Private F. F. Previously deaf, worse since he was blown up by trench mortar. Shrapnel wound of back. Feels dazed. Loss in right *nil*; ? laceration of left membrana tympani. There was horizontal nystagmus to right.

No. 41.—Private R. V. Shell burst on parapet. He was dazed; had discharge, pain and deafness on left; horizontal nystagmus to right. Tuning fork C_4 very short right and left.

No. 42.—Corporal L. Y. Trench mortar burst on top of the trench, causing deafness, noises in the left ear, and bleeding. There is an intra-membranous clot at left umbo. Horizontal nystagmus right and left, more marked to right.

No. 43.—Private T. B. Shock due to the bursting of a præmature. Caused deafness right and left and buzzing. There was rotatory nystagmus to the right. Tuning forks, not much loss.

No. 44.—Pioneer J. S. Always deaf; C.D.C. changes. Guns make him worse by bringing on buzzing noises which are much worse in left ear. Horizontal nystagmus to left.

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[1] Lee, *Journ. Phys.*, 1903, xv, p. 328.

Analysis of Shell Concussion Effects on the Internal Ear.

The membrana tympani is of much greater area than that of the fenestra ovalis. The ossicles convey the vibrations from the large area to the small; much greater force must therefore be applied to the small area. We should expect different effects on the internal ear if the full force has been transmitted to the fenestra ovalis, the membrana tympani having withstood the force of concussion, and a less effect if the membrana tympani has been lacerated, much of the force being lost; and in cases of otitis media suppurativa with large losses, where the remains of the membrana tympani and the diseased condition of the contents of the middle ear have been much minimized in value as transmitters. I shall select cases falling into the three classes, and then consider the effects.

(*A*) *Membrana Tympani remained intact.*

No. 85.—K. Deafness, left most, right less; following Delville Wood; quite right before, never had discharge from ears. Has noises like "engines" in left ear now. No evidence of pre-existing disease.

	R.	L.
C_1	*Nil* A.C. or B.C.	*Nil* A.C. or B.C.
C_2	– short	*Nil*
C_4	Short	*Nil*
Rotatory test	Feeble and slow	*Nil*
Caloric test	Feeble	*Nil*
Weber	Weber	

No. 86.—B. Buried by shell; no previous trouble. Deafness, dizziness and noises followed.

	R.	L.
C_1	*Nil*	*Nil*
C_2	– short	*Nil*
C_4	Short	*Nil*
Rotatory test	Very slow, long excursion	Very slow, long excursion
Caloric test	*Nil*	*Nil*
Weber	Weber	

No. 73.—W. Was firing 12in. howitzer from Dainville Station; had been on large gun fire before. On this occasion the howitzer was in a cutting, two sides of which were closed in.

	R.	L.
C_1	+	+
C_2	+	+
C_4	Very short	Very short
Rotatory test	Normal	Normal
Caloric test	Normal	Normal
	Weber	

Vide Nos. 52 and 42 previously mentioned.

No. 64.—B. Following Mametz Wood. Deafness right and left, singing noises; previous C.D.C.

	R.	L.
C_1	+ short	+ short
C_2	+ short	+ short
C_4	Very short	Very short
Rotatory test	Normal	Normal
Caloric test	Normal	Normal
Weber does not lateralize.		

No. 54.—B. Was buried. Deafness right and left at first, right passed off in seven or eight hours; was dumb for three hours; giddy and straining noises. No previous existing disease. There was a blood spot in the left superior quadrant.

	R.	L.
C_1	+	– short
C_2	+	Neutral
C_4	Good	Very short
Rotatory test	Normal	Normal
Caloric test	Normal	Normal

(B) Membrana Tympani Lacerated.

No. 49.—McG. Shell burst a few yards from him, injuring the left side of face, jaw, and eye, and causing deafness, giddiness, pain, buzzing, and discharge of blood in left ear. There was a laceration at left umbo and hæmorrhage in the attic region. Right intra-membranous clot at umbo and small blood spots.

	R.	L.
C_1	Neutral	–
C_2	–	– short
C_4	Heard well	Heard short
	Weber	
Rotatory test	Feeble	Feeble
Caloric test	Feeble	Feeble

No. 55.—F. Trench mortar fell and exploded on top of parapet; caused deafness right and left. No previous disease. There was a blood streak down the handle of the malleus on the left, and the membrana tympani was lacerated at the anterior inferior quadrant.

	R.	L.
C_1	–	–
C_2	– very short	– very short
C_4	Very short	Very short
Weber	*Nil*	*Nil*
Rotatory test	Feeble	Feeble
Caloric test	Feeble	Feeble

Vide No. 56 previously mentioned.

No. 59.—Lieutenant P. Trench mortar fell on trench and burst two yards from him. Pre-existing disease *nil*. Deafness, left. The left membrana tympani was very red and lacerated at anterior inferior quadrant; discharge of muco-pus, blood-stained.

	R.	L.
C_1	Felt only	Felt only
C_2	+	– very short
C_4	Heard well	Heard very short
Weber		Weber
Rotatory test	Normal	Very exaggerated normal
Caloric test	Not performed	Not performed

Vide No. 60 previously mentioned.

No. 63.—M. A shell burst at the back of him and he was blown into the air. Deafness right and left, unconscious 1½ hours; continuous headache, hissing noises; right improved, not left. Pre-existing c.d.c. Left membrana tympani lacerated at inferior quadrant.

	R.	L.
C_1	+	– short
C_2	+	– short
C_4	Heard well	Very short
Weber	Weber	
Rotatory test	Normal	Feeble
Caloric test	Normal	Feeble

No. 65.—P. Heavy guns, fired whilst he was in a communication trench, caused deafness and noises, and discharge from left ear due to laceration in upper quadrants.

	R.	L.
C_1	– very short	– short
C_2	– very short	– short
C_4	Very short	Short
Weber	Weber	
Rotatory test	Feeble	Feeble
Caloric test	Feeble	Feeble

No. 74.—E. S. Big shell exploded a few feet off; wounds of hands followed by left deafness, blood from left, hissing noises, discharge two days later. There was general redness of left membrana tympani and a laceration at anterior inferior quadrant.

	R.	L.
C_1	+	–
C_2	+	– short
C_4	Normal	Very short
Rotatory test	Exaggerated	Feeble
Caloric test		

(C) Membrana Tympani Previously Lost.

No. 11.—S. Shell burst near him, 15 yards off. Always deaf right and left, deafness much increased by the explosion. ? congenital syphilis.

	R.	L.
C_2	*Nil*	*Nil*
C_4	*Nil*	*Nil*
Rotatory test	Normal	Normal
Caloric test	Normal	Normal

No. 23.—Previously mentioned.

No. 28.—B. Aërial torpedo burst on parados, buried him; deafness, right and left, noises, inability to walk. Right ear got better.

	R.	L.
C_2	+ short	+ short
Weber	Weber	
Bone conduction over left mastoid heard in right ear *only*.		
Rotatory test	Exaggerated	Exaggerated
Caloric test	Exaggerated	Exaggerated

No. 47.—*Vide* previously mentioned.

No. 75.—B. Trench mortar shell burst and he was struck by mud; face and scalp injuries. Deafness in left, discharge after three days; singing in left, blood in throat. Pre-existing old losses right and left, recent slit in posterior superior quadrant, left, and a hæmorrhage in posterior superior quadrant, right.

	R.	L.
C_1	–	– short
C_2	–	– short
C_4	Heard well	Short
Weber test	Weber.	
Rotatory test	Normal	Normal
Caloric test	Normal	Feeble

No. 83.—*Vide* previously mentioned.

Class A: In only two cases (85 and 86) of the 100 examined was there total inability to hear tuning forks C_1, C_2, C_4; in these cases also there was practically no response to caloric tests, and there was peculiarity of the nystagmus to rotatory tests, showing some marked derangement. No. 85 required a full quart of *hot* water to produce reaction, which was then feeble and slow. No. 86 required nearly as much additional turning to produce a reaction which was then of extreme excursion, the eyes moving to their full limits—internally and externally—and very slow. Effect of explosion fairly equal on right and left, and C_4 most affected.

In Class B there was never total inability to hear C_1, C_2, and C_4, and only feeble response to rotatory and caloric tests, except in a couple of cases where rotatory and caloric tests gave much exaggerated response.

In Class C there was never total inability to hear C_1, C_2, and C_4, except in No. 11, and I am inclined to think he was a case of otitis interna syphilitica, deprived of his small amount of hearing by the explosion, and the response to rotatory and caloric tests was more often normal than otherwise, although excitation and depression were seen.

Taking the cases collectively the forks C_1, C_2, C_4 are generally shortened on the side most affected, or equally on right and left if both have been equally exposed. The tone area for C_4 is certainly the most affected. There is at times marked shortening for C_1 and C_4 in comparison with C_2. Again, C_1 and C_2 may be normally heard and C_4 at very short distance. Weber lateralizes to the side least affected, and though both right and left were seriously disorganized in Nos. 85 and 86, there was lateralization to the side on which the forks were still faintly and shortly audible. In No. 73, Weber C_2 lateralized to a side—the sides having equal acuity. In No. 59, Weber lateralized to a side—very defective although the opposite side was normal. On performance of Weber test with the two forks C_1 and C_2—in some cases the former would lateralize to one side and the latter to the other, or C_1 would lateralize and C_2 not do so—and vice versa.

Caloric tests : Very much more water, either hot or cold, was required in performing the labyrinth tests as compared with amount usually required for functionating in normal cases. Two quarts and more had often to be used before a response was noticed. The nystagmus varied very much, but it was definitely present in every case except Nos. 85 and 86. It was often very quick and feeble, this was the common one—or very slow and feeble—in one case the nystagmus was so coarse in its movements, I can only compare them to the movements of the pendulum of a big clock, slow with long excursions. In a few cases the nystagmus was quickly induced and very violent. In these cases the patient looked deadly pale, with extreme giddiness, faintness, and vomiting ; in two the effect was so prolonged the cases were unable to return to their ward for fifteen to twenty minutes.

The rotatory and caloric tests corresponded in their effects except in a very few instances, notably No. 83.

It is evident that certain parts of the organ of Corti are often more seriously damaged than others, and that the labyrinth may be rendered hypo—or hyper—excitable. Anyway, its normal equilibrium is much altered. It is evident that most effect on the internal ear is produced through an intact membrane, and one which stands the force of the explosion ; also that the effect is less when the membrana tympani lacerates, and still less in the conditions of previous loss of membrana tympani.

Causation and Prognosis.

Shell concussion deafness is possibly due to three contributory factors:—

(1) Cerebral concussion.

(2) Overstrain and fatigue of the organ of Corti: the former being due to violent oscillations of the perilymph communicated to the organ of Corti, and the latter to continuous violent noises or explosions at close quarters.

(3) Temporary or permanent disorganization of the conductive apparatus.

The prognosis depends on the recovery of these parts.

(1) The patient experienced a great shock and was, in many instances, buried. He became suddenly deaf, and often dumb also. In other cases, he could not see, or had paresis of arm, leg, or both legs. Here the higher centres were temporarily involved. One watched the almost sudden improvement in hearing in a few days as shock passed off, and the disappearance of nervous symptoms generally when the patient was removed from the firing line.

(2) A portion of deafness remains to be more or less slowly recovered from by the return of the internal ear to a normal or nearly normal condition.

(3) Structural damage must leave a permanent imperfection of function—a ruptured membrane; a dislocation, partial or complete, of the small bones from one another, or the stretching of their attachments to the tympanic wall.

These, in other larger but similar conditions, are only slowly recovered from, if ever in many instances. I am able to quote from cases seen three or four months later, showing a great recovery of hearing. The loss in these cases was practically due to the macroscopic structural damage, and the frequent sequela, chronic otitis media suppurativa, but from the information gained from the cases I have seen, I believe that shell concussion deafness is, to a large extent, temporary and curable.

Major SHUTER.

I would like to make a few remarks on one aspect of the subject. My experience has been with cases of ear injury some months after it has been inflicted—i.e., in the Australian troops who came from Gallipoli, and from the English hospitals.

I shall not speak of direct traumatism. I am in accord with most of what has been said, but I wish to speak of what is termed concussion injury, and what a second speaker referred to as nerve deafness. I have seen a large number of such cases, but my work has not enabled me to go so thoroughly into the matter as the last speaker has gone: mine is a roving commission. I differentiate, however, between machine gunner's and concussion deafness; in the former there are islands of deafness. I have seen a large number of cases which show the following combination of signs. They frequently occur in those who have a very patent meatus, and, contrary to Lermoyez's opinion, I found them more frequent in those with pre-existing middle-ear disease. Mr. Scott asked: "How do you know they have had pre-existing middle-ear disease?" In these cases the obvious signs of middle-ear disease are so frequent that, when one considers the number of normal middle ears compared with diseased middle ears, it is a reasonable opinion to state. They are due not to sound waves, but to the wind waves caused by a shell explosion. I have seen them also in a case in which a German mine was exploded in a confined space; I have seen them in trench cases and after bomb explosions, in which the patient has been rendered unconscious and deaf for forty-eight hours. They present themselves some months afterwards with this combination of signs: marked diminution of bone conduction, tinnitus, paracusis, hearing better in a quiet room, and hearing lower tones by air conduction proportionately better than higher.[1] Yet apparently they have a very complete range of hearing. I should like to hear from some present why we assume that diminished bone conduction and diminished air conduction for the higher forks means nerve disease. I do not know where the statement originated, or on what reasoning it is based. One can physiologically alter the bone conduction by putting the finger in the ear, or by inflating the ear, or by the Gellé test. It is altered very much by middle-ear disease, and a very pertinent fact is that it is greatly increased in cases where there is fixation of the stapes. I think in the cases I refer to there is some alteration in the conducting apparatus—it may be the ossicles, it may be the foot-plate of the stapes, or an alteration in the accommodating mechanism of the opposing action of the stapedius muscle and the tensor tympani. However, the matter has puzzled me, and I should like to know whether others have noted this combination of signs. I should welcome any expression of opinion.

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[1] The range of hearing was taken by a monochord, which shows perception of pitch up to an average of 25 cm. by air conduction, and 18 to 20 cm. by bone conduction. This is only a little lower in my experience than a normal ear.

Mr. Sydney Scott.

It is highly significant that the Dominion Governments should have sent representatives of otology to investigate the ear cases among their Forces in the Army. Our methods of practice in otology in civil life singularly well prepare us for investigating cases we meet with in warfare. After a little experience of the actual conditions near the fighting line, at the base, and in England, I am convinced there is much for otologists to do. Certain cases of injury require considerable time to ascertain the true state of affairs. It is not sufficient merely to look at the drum and see how far a watch can be heard! Some cases will take an hour or more to examine. We need not only to apply tuning-fork and other hearing tests, but frequently have to investigate the vestibular functions, to say nothing of the examination of the nose, pharynx and Eustachian tubes. And the results are well worth the same care we take in civil life. With regard to the hearing tests there are three features I think we should consider. The first is the determination of the "tone-range"; the second of "tone-acuity," and the third "tone-analysis." The first is measured by forks and the monochord, which is far superior to Galton's whistle.[1] "Tone-acuity," for a given tone or group of tones of known intensity is recorded by the distance-limit of hearing a watch or acoumeter. Under "tone-analysis" will come the faculty of hearing the voice as whisper or in conversation. We have met with patients who have a short tone-range—e.g., 16 d.v. to about 1,000 d.v. or less, who can hear conversation at 2 or 3 metres. Others, whose hearing became defective after being buried by shell fire, may retain normal tone-range and have very defective tone-analysis—that is, they exhibit great difficulty in distinguishing words of speech, especially in a noise. We meet with similar conditions in civil life, but they have been classed under senile or nerve deafness of doubtful cause.

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[1] "Discussion on Value and Significance of Hearing Tests," *Proc. Roy. Soc. Med.*, 1912, v (Sect. Otol.), pp. 113, 131.

The importance of considering the vestibular system is self-evident to those familiar with the manifestations which injury to the ear frequently evokes. But it hardly seems sufficient merely to say that the caloric test was done with hot or cold water, without observing precisely what the posture of the head was during the application of the test; for otherwise we may obtain normal reactions on both sides, with the head in certain positions, though a unilateral lesion actually exists. As an example, in a man suspected of malingering, I found by setting his head in requisite positions that one of his semicircular canals did not react to the caloric tests, whereas all the other five canals reacted normally. The results of "caloric" and "rotation" tests tallied with each other. The man had no appreciation for the short monochord in the affected ear (i.e., high limit was below 5,000 d.v.), but he could hear my long monochord. The low tone limit was raised on both sides. He had active nasopharyngeal catarrh at the time, and catheterization definitely improved his hearing for low tones, bringing him back to the 16 d.v. limit, though it did not of course affect the high tone loss. Nevertheless the hearing became good and useful, both as regards tone acuity and tone analysis.

We all greatly appreciate the very fine work Mr. Fraser has sent us to-night. We see there one end of the story in the pathological findings in fatal cases subjected to the effects of high explosive violence, but we have yet to see the concurrent clinical manifestations recorded side by side with such pathological findings. In the specimens which I showed last year[1] from the soldier who was wounded in the vertex of the skull, there was free hæmorrhage in the tympana, without fracture or rupture of the drum or any other injury such as we see in some of Mr. Fraser's cases, and although, fortunately, it was possible to test my case during life, the records were incomplete because suitable instruments were not available at the time. We hope this gap in our knowledge will soon be filled, as the result of such work as it is now possible to carry out. I think, Sir, we might commend to the War Office the appointment of more otologists to investigate and report upon the various forms of injury to the ear, due to the War, in the way that is being done in the Canadian hospitals for the sake both of the individual and the State.

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[1] "Histological Preparations of the Labyrinths and Tympana of a Soldier suffering from Deafness due to a Bullet Wound of the Vertex of the Skull," *Proceedings*, 1916, ix (Sect. Otol.), p. 28.

Captain E. A. Peters, R.A.M.C.

Deafness due to gunshot wound and high explosive concussion falls into three groups:—

(1) (*a*) The membrana tympani may be ruptured by gunshot wound or high explosive concussion; (*b*) the auditory meatus obstructed by a fragment of metal; (*c*) the middle ear may be filled with blood. The smaller extravasations are absorbed, but others break down into abscesses. The condition may occur as the result of the regional disturbance or high explosive concussion.

(2) Labyrinthine deafness. This is probably due to hæmorrhage or vasomotor change. It is a very common form of war deafness and the prognosis does not seem to be good. I have not been able to observe the microscopical condition, but that such a condition exists may be assumed (*a*) from the œdematous congested state of the larynx observed after gunshot wounds in the proximity; (*b*) the hæmorrhage common in the brain with intact dura mater consequent on gunshot wound fractures in the vicinity. It results from direct blows or high explosive air-conducted concussion. The following is a typical case:—

M. Buried by a shell fourteen days previously; he was hit by a fragment behind the right ear.

0·		S. watch		$\frac{24}{30}$
– 15 seconds	...	c mastoid	...	Normal
18,000	...	Monochord	...	30,000
T. F. 64	...	Lower limit	...	T. F. 64

Rotation for external semicircular canal, clockwise: exaggerated nystagmus; anticlock, normal.

There was some evidence of fatigue, but no giddiness.

The patient is usually concussed, and the ear exposed to the fuller force is more affected. The semicircular canal system and cochlea may be affected in different degrees; the cochlea does not recover so quickly as the semicircular canals. Both ends of the register are affected, but the higher notes more regularly.

(3) Psychical or central deafness is comparatively rare. It is symmetrical and usually absolute deafness, and is often associated with mutism or stuttering speech. This form of deafness is dealt with by Major Hurst.

These three forms of deafness may coexist and contribute a factor in different proportions in a given case.

Major A. F. Hurst, R.A.M.C.

As a result of my observations on cases of functional deafness, deaf-mutism and so-called "hyperacusis" in soldiers in the Neurological Section at Netley, I have come to certain conclusions as to their ætiology.

(1) *Deafness.*—The deafness is hysterical and due to auto-suggestion. The momentary deafness, which is the natural result of the terrific noise caused by the explosion of a big shell in the immediate neighbourhood, may make such an impression on the mind of a soldier that, on coming to himself, whether he has actually lost consciousness or not, his first thought is for his hearing, especially if it was already impaired by preceding disease, and he may be so convinced that he is permanently deafened that he becomes actually deaf as a result of auto-suggestion. Hearing necessitates listening. Inattention during a dull sermon results in total deafness to the sermon, and in hysterical deafness the patient is so convinced that he cannot hear that he does not listen; although the sound vibrations reach the ear in the normal way, they do not give rise to the slightest auditory sensation because of this inattention. The synapses at one or more of the cell-stations in the auditory path to the cerebral cortex must therefore be unswitched, probably as a result of retraction of the dendrons. I shall presently show that the auditory-motor or "jump" reflex is a function of the mid-brain. In the absolute deafness of shell shock this reflex is abolished or greatly diminished. A very nervous but totally deaf mute remained completely unmoved, never jumping nor showing a flicker of his eyelid during one of the severest thunderstorms I have known, and yet the next day he was completely cured by suggestion. In some cases the reflex is present when first noted, but disappears more or less completely when the test is repeated. One of the unswitched synapses must therefore be below the mid-brain, and either in the auditory nucleus or, less probably, in one of the intermediate cell-stations—the superior olive or the nucleus of the lateral fillet. It is very much easier to cure pure mutism than pure hysterical deafness, because by simple persuasion and re-education the mute can be induced to use the muscles involved in speech, and in severer cases the excitement caused by some unexpected event, or by alcohol or ether, is enough to cause involuntary speech, for when once a word has been uttered involuntarily the mute is convinced that he is cured. If this occurs in

a deaf-mute, the return of speech generally convinces him that he can also hear; he therefore listens, and the unswitched synapsis is once more switched on. Deafness without mutism in shell shock is, in my opinion, almost always of the same nature and not due to any gross lesion of the labyrinth, as so far as I know this has never yet been proved to occur in the absence of external injury; the ruptured drum often seen is also of small importance, as it in no way influences the rapidity of recovery in hysterical deaf-mutism. In spite of this it is often exceedingly difficult to restore the hearing in the absence of mutism, and many cases have, I believe, been regarded as the result of some actual destructive lesion because of their persistence. In such cases suggestion under hypnosis almost always cures unless the deafness is so absolute that the patient cannot even hear shouting through an ear-trumpet, in which case it is impossible for suggestions to have any effect, as the unswitched synapsis remains unswitched in hypnosis, and commands, which in other hypnotized individuals are immediately obeyed, do not reach the cortical centre of hearing and are therefore not obeyed. As I have found that hysterical manifestations, such as contractures and anæsthesia, disappear during sleep, it might be expected that hysterical deafness would behave in the same way, but this is not the case. Three men suffering from total hysterical deafness without other symptoms were put into a hut by themselves. During the night an alarm of fire was raised, but in spite of shouting and banging a poker against a shovel within a few inches of their ears, neither of the two who were asleep when the ward was entered woke up. The auditory motor reflex occurred in one patient, in whom it was present when awake, but in the other, who had no such reflex when awake, it was absent.

(2) *Exaggerated Auditory Motor or Jump Reflex, so-called Hyperacusis.*—A sudden noise normally causes an individual to jump and blink, and at the same time his pupils dilate; the "jump," at any rate, is a protective reflex and represents the preparation for flight or fight. An officer whose left motor cortex had been almost completely destroyed went to see "The Man that Stayed at Home" about four months after he was wounded. His right arm jumped violently when the gunshot rang out on the stage, although no trace of voluntary movement returned until three months later. The motor part of the reflex is thus subcortical. In war neuroses in which the reflex is exaggerated, jumping continues during sleep and deep hypnosis, although the patient does not hear the noise which induces it, even

in a dream. That the reflex is quite independent of actual hearing is shown by the fact that during deep hypnosis with the eyes open, individuals in whom the reflex is normal or only slightly exaggerated do not jump or blink, and the pupils do not dilate even when a poker is banged against a shovel within a foot of the ear, although they answer even whispered questions and obey whispered commands.

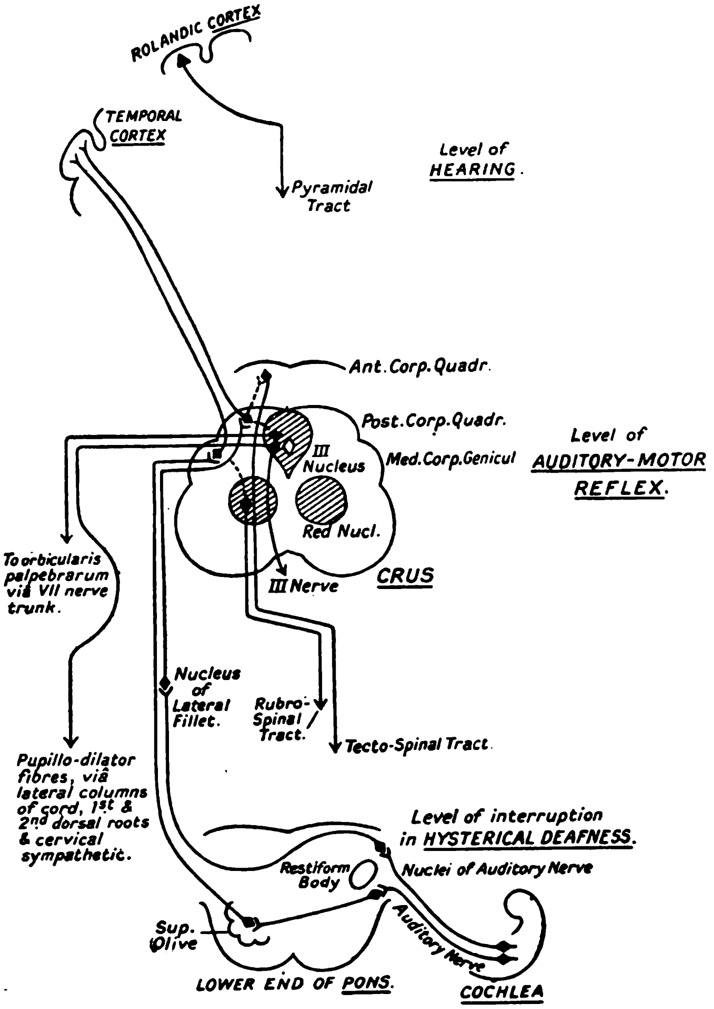

Diagram to illustrate the neurones concerned in hysterical deafness and in the auditory-motor reflex.

I have already pointed out that the reflex is abolished in complete hysterical deafness, so it must occur above the synapsis, which is unswitched in this condition. This suggests that the reflex centre is in the posterior corpus quadrigeminum or medial corpus geniculatum, and the close relation of these centres to the blinking and the sympathetic pupillo-dilator centre in the neighbourhood of the third nerve nucleus and to the anterior corpus quadrigeminum and red nucleus, in each of which a descending motor track originates, gives an anatomical basis for this view[1] (*see* fig. p. 117). The very common exaggeration of this reflex in soldiers suffering from certain war-neuroses is not, therefore, correctly described as hyperacusis, for the sense of hearing may be no sharper than normal, and actual hearing need not occur at all, as the reflex occurs when they are asleep and hypnotized; it is simply a part of the general exaggeration of the defensive reflexes, which is a very characteristic feature of those war-neuroses that are due rather to emotions than to the actual concussion of pure shell shock. In severe cases the patient appears to be in extreme terror: he jumps violently and trembles from head to foot at the slightest sound, and raises his arm as if to protect his face from a blow and hides his head under the bedclothes when anybody approaches him. Terror is at first actually present, for the patient never ceases to think of the horrors he has passed through, and he constantly pictures them before him, while every sound reminds him of the bursting of shells. But after all trace of terror has disappeared as a result of suggestion under hypnosis, and the patient no longer thinks or dreams of the horrors of war, the appearance of terror may continue unabated. This is due to jumping and flinching being defensive reflexes; the intense emotions to which the patient has been subjected leads to such an increase in the excitability of the central nervous system that the exaggerated reflexes persist after the cause of their exaggeration has disappeared. In one severe case true hyperacusis was also present, and Captain Peters estimated that the patient heard sixteen times more acutely than the average normal individual. The hyperacusis and exaggerated defence reflexes were entirely uninfluenced by the administration of 100 gr. of bromide a day. The possibility of the jump reflex occurring in the absence of actual hearing, and being absent when hearing is not abolished, is of some practical importance, as I understand that the presence or absence of the reflex is often used as a test of complete deafness in mute children and in supposed malingerers, whereas its presence is not really a proof that actual hearing occurs.

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[1] Since this note was written Professor C. S. Sherrington tells me that he and Forbes found that an incomplete jump reflex occurs in the decerebrated cat, and that both the posterior corpus quadrigeminum and medial corpus geniculatum were concerned in the reflex.

Mr. E. D. D. Davis.

My experience agrees with what you have said, Sir. But there is one question I would like to ask Dr. Gordon Wilson—namely, the difference between nystagmus of cerebellar injury, and that due to injury of the labyrinth.

Lieutenant-Colonel Goldsmith, C.A.M.C.

I shall address myself to the question asked by Dr. Grant, as to the amount of hearing necessary for a man to be in the Service, and the question of middle-ear suppuration. It is laid down in the Army Council instructions what amount of sight a recruit must have in order to be considered fit. That standard has been lowered as man-power has become more necessary. But the amount of acuity of hearing necessary has not been laid down, nor is it possible to lay down in an accurate way. The Canadian Army Medical Service has tried to lay down how far off a man should hear conversation voice in order for him to be placed in A, B, or C classes respectively. A man who hears ordinary conversation 15 ft. away in each ear, and who has no organic disease of the ear, can be accounted fit for Class A. But it must be known with certainty that the other ear has been carefully closed during the test and that the speaker has not been seen, because many men in the course of years have learned to get along by lip-reading. If a man who is at all deaf is put in a listening post, he may seriously endanger his company. If he can hear a conversation at 21 ft. with one ear and is deaf in the other, he is also classed A. The Canadian regulations are as follows :—

Hearing and Nasal Condition.—Category " A " : A soldier who can hear 15 ft. or better in each ear by ordinary voice, and who has no organic disease of the ear, shall be placed in Category " A." A soldier who has hearing of 21 ft. in either ear, but with little or no hearing in the other ear, but without active organic disease, shall be placed in Category " A." No soldier with a discharge from his ears shall be placed in Category " A."

Category " B " : A soldier who has hearing of 15 ft. in either ear and little or no hearing in the other ear, and has no active disease in either ear, will be placed in Category " B " (i). A soldier who has better hearing than 12 ft. in each ear, but has a discharge from either ear of a moderate degree, or is subject to frequent recurrent discharge from the ears, of a moderate degree, may be placed in Category " B."

Category " C ": Soldiers who show symptoms of chronic ear conditions, such as hearing reduced to less than 15 ft., with freely discharging ear or ears, or shell concussion deafness, shall be placed in Category " C." A soldier who has fully and recently recovered from a mastoid operation shall be placed in Category " C " for three months and then regraded.

Category " E ": Cases that show repeated signs of recurring serious ear conditions, such as recurring mastoid pain, free formation of granulation tissue, indications of bone disease, or free, full and offensive discharge from the ears, should be reported upon by an otologist with a view to being placed in Category " E " for discharge as permanently unfit.

Nasal Condition.—Soldiers suffering from severe nasal obstruction should be sent to a specialist medical officer in charge of ear, nose and throat diseases attached to one of the Canadian Military Hospitals, for report, and if necessary, treatment, before being sent overseas, as it is found that such cases find it difficult, and in some cases impossible, to wear respirators.

Tonsils.—Enlarged tonsils which were present previously to enlistment should not be removed unless they show signs of chronic inflammation, or recurring acute attacks of inflammation interfering with Active Military Service. All cases other than above, should be placed in Category " A." Where the removal of chronically inflamed tonsils will fit a soldier for Category " A," operation should be performed.

With regard to middle-ear suppuration, it is laid down in the Canadian Services—and I do not agree with it—that a man with middle-ear suppuration is not to be sent to France. Because a man has had discharge from his ear, it does not follow that he will "go sick" with it, and it will not do to say he is liable to mastoiditis or brain abscess, or acute suppurative labyrinthitis, since he is much more liable to be shot. A man whose hearing allows him to " carry on," and who has no active inflammatory condition in any of the surrounding structures, such as the labyrinth, the mastoid, or lateral sinus, can quite well go to France. And if you were now to bring from France all the men with chronic middle-ear suppuration, you would have battalions of them all over the country. In Boulogne, in 1914, I removed polypi which projected from the meatus, from dozens of men, and sent them back to the front. They had some discharge from the ear, but it was able to escape, and the men continued to be just as good soldiers. As the demand for men becomes greater, aurists should not put greater difficulties in obtaining men in the way of the military authorities. A man may have middle-ear suppuration for years without it causing him trouble, and the Regimental Medical Officer should not allow him to make use of it as an excuse to be sent back.

So far as concussion is concerned, it has struck me, on examining many of these cases, particularly for medical boards, that if you go into the history you will find many of the men have had deafness before the War, and their drums will show evidences of it: and particularly in that type of chronic middle-ear deafness with open Eustachian tubes and thickened drums, in patients who hear better in a noise but are not of the type called pure otosclerotics. These matters will be of great importance when dealing with pensions boards. If a man has been deaf before the War, and has been a lip-reader, that fact should be stated in reports. The amount of disability is based upon those reports, and it is very necessary that the aural report should be complete. If it says a man can hear ordinary conversation at 11 ft. with one ear, the word used in the examination should be stated, because when the case comes for review from the standpoint of a pension, someone else will examine him, and the same word should be used, otherwise the patient may say he is worse. I think Politzer's acoumeter should be used in all these cases. At the present time these matters are carelessly recorded.

In recording the tuning-fork tests, which I think should be done, particularly in pensionable cases, so that a record for future comparison may be obtained, it is necessary when stating the result of the Rinne test to do so with two forks, C 512 and C 256, and to record how many seconds plus or minus. Furthermore it is of value to record the low and the high limit. The high limit should be stated not by naming the highest fork heard, since this will probably not be more than C 3,012, but by recording the monochord reading, which definitely registers the upper limit. In special cases labyrinthine tests will be required, and even a neurological examination. Schwabach's test should be similarly recorded, and it is to be remembered that in cases of neurasthenic deafness the fatigue period is particularly noticeable. Many cases of perceptive deafness hear all the high forks but for a shortened period, and it will add to the accuracy of the report if this record is made.

Experienced aural surgeons should make the special reports on ear cases just as ophthalmic surgeons are so required to do in Chelsea Board cases, so that there will be a definite record of the man's condition. This will be invaluable to those who have to report a second time, when the pensioner comes up for review, and will ensure that while the State is more carefully protected, the man suffers no injustice.

One should be very guarded in advising nose and throat operations during war time. I am sure a great many officers and men have undergone operative treatment for conditions which have existed before the War, and in whom active service has produced some increase of discomfort or inconvenience, but not enough for their state to be classed as a *disability*. The real disability is the operation itself, which results in the State losing the services of the soldier for many weeks. My own opinion regarding us Canadians is that we do not react very well, after nose and throat operations, in this country unless we have been here a considerable time. Our soldiers are all subject to an increase in their rhinitis and rhino-pharyngitis, which will subside in warmer weather. I have seen many cases of officers and men who have returned from France with various wounds, whose stay in hospital has enabled a long-standing nasal condition to be discovered, and who have undergone operative treatment even though no disability has been present. In civil life we are quite justified in relieving discomfort and inconveniences in our patients if they wish for such relief, but in military life the services of the soldier belong to the State and we should be very careful that we do not take too much liberty with such services. Furthermore I wish to draw your attention to the responsibility each one of us assumes when answering the question as to whether the disability is the result of active service, or whether it is aggravated by it.

Mr. Hunter Tod.

My experience of these cases, although not so great as that of others, as I am not attached to a military hospital, has been that bone disease, the result of direct injury by bullet or shell fragments, is more difficult to cure than in civil cases because of its more septic nature.

Partial nerve deafness and tinnitus, unaccompanied by any lesion of the tympanic membrane, is not uncommonly caused by the explosion of shells or from a projectile passing close to the ear. This was well shown in one case, that of a sailor, in which the tragus was taken off and the concha pierced by a bullet which just grazed the side of the head. In association with the traumatic perforations, tinnitus seems to be the chief subjective symptom, especially in regard to prognosis. What answer can we give to the repeated question: "When will the noises cease?"

I am interested in what has been said about the caloric test. It is a very important test with regard to prognosis in internal ear concussion, and therefore also from the point of view of pensions. I had an officer who came to me shortly after the beginning of the War who was completely deaf for all sounds—the result of shell concussion—and he had been so for three months. He took a long time to react to the caloric test; but as he gave a mild reaction I told him, although I then had no experience to guide me, that he would probably recover his hearing. He went to Scotland, and I understand that his hearing is now practically normal.

In answer to Dr. Dundas Grant, there is no standard of hearing for our Army. I once applied for a definite statement as to the standard of hearing required for recruits, but the only answer I received was that the hearing should be good.

In cases of middle-ear suppuration we surely should take the same sensible view as in civil practice—for example, when testing for insurance. If there is perforation of the membrane, but no sign of bone disease, there is no harm in sending a man out to the front. If there is bone disease of the tympanic cavity or its walls, or signs of chronic mastoid disease, I would not send him out, because even if the soldier has no serious symptoms at the time of examination he will be a nuisance to the medical men at the front.

I take advantage of this meeting to suggest that we might combine in representing to the Army Council that we should be better represented in the Army, and that aural consultants should be appointed.

MR. SOMERVILLE HASTINGS.

Since the beginning of the War, I have seen a good many cases of injury at two fair-sized hospitals, and what has struck me most is, the amount of injury the normal ear will stand without permanent affection of the hearing power. I have seen comparatively few cases in which I could be sure the membrana tympani had been recently ruptured. Very many cases of perforation have come under my notice in which the deafness was stated to have followed a recent injury, but in only a few of these did the appearances agree with this. I have also noticed the frequency with which both types of concussion deafness occur in ears already injured by perforations without discharge, or by thickening of the drum, or scarring. Another point which has not been mentioned tonight is, I think, the frequency of cases of suppuration in which one gets a history that when the patient was a child, suppuration in the ear occurred for a time, or in which there may be a large perforation with no history of suppuration at all. And yet suppuration starts again after a concussion, or after the man has been blown up by a shell, or buried in a trench.

The PRESIDENT.

In the interesting discussion we have had many important points have been brought forward. I do not profess to be able to answer the questions which have been asked, as I have not had sufficient experience, my main work in connexion with the wounded having been general surgery. This discussion has opened up fresh points for us to think over and to bear in mind when examining patients in the future.

Section of Otology.

President—H. J. MARRIAGE, F.R.C.S., Captain R.A.M.C.

(*May* 18, 1917.)

Cerebrospinal Fluid escaping from the Ear for Twelve Months.

By J. F. O'MALLEY, F.R.C.S.

DRIVER E. R., aged 27, came under my care seven months ago, with the following history: He stated that he underwent a mastoid operation, performed by Dr. Paterson, of Cardiff, about ten and a half years ago. The result was excellent for about six years, when a polypus formed and was removed. After this he emigrated to Australia, and during his two years' residence there he had polypi removed twice. About eighteen months ago he had a polypus removed at Nottingham, and the ear began to drip soon after, the escape of fluid being worse at night.

When he came under my care early in September, 1916, the condition of his ear was as follows: There was a free flow of watery fluid dripping from the lobule of the right ear and escaping from the external meatus. The meatus was completely blocked by a smooth cyst-like swelling, which, if examined hurriedly, would be easily mistaken for a polypus. It was the scar tissue lining of the mastoid cavity, raised by the cerebrospinal fluid from the bony facial ridge and antral cavity. There was some pus in the meatus also. After keeping him under observation for about a week and getting the meatus as free from pus as possible, I decided to re-open the mastoid and clear out the old scar tissue and the focus which provided the pus. In doing so no difficulty was encountered, but I was unable to localize the bony defect, though I formed the opinion then that it was in the promontory. The operation cavity was packed with sterile gauze soaked in iodoform emulsion and the usual dressings applied. These were all soaked through next day by the cerebrospinal fluid and had to be replaced. The same condition was found on the second day and also on the third, but as he complained of discomfort all dressings were removed, when the mastoid skin wound and the whole operation cavity was found profusely bathed in pus.

The cavity and wound edges were now cleaned twice daily with 40 per cent. rectified spirit and loosely packed with ribbon gauze wrung out of this solution. A material improvement set in in a few days, but the cerebrospinal fluid continued to soak through the dressings for six weeks. As the cavity was now almost free from pus, I dusted in a little boric powder and packed it very firmly with sterile gauze each day. I was now able to localize the point from which the fluid escaped very definitely—namely, the posterior part of the attic, near the aditus. The escape of fluid gradually diminished, but even as late as December 28, 1916, that is, about three months after operation, 1½ dr. was collected in four hours.

The leakage of cerebrospinal fluid ceased early in January, 1917, and the mastoid wound and middle-ear cavity were soundly healed before this date, but the antral cavity has been slow to fill up and form a strong scar. It is still supported by a gauze packing inserted twice weekly, although the soldier has returned to light duty and is otherwise well.

The degree of hearing in this ear is negligible, but the labyrinth responds to caloric tests.

The case seems to be of special interest for the following reasons:—

(1) The large amount of cerebrospinal fluid which a patient may lose over a long period without any apparent injury to health. I have estimated that he lost over 1½ gallons in three months.

(2) The influence of the cerebrospinal fluid in producing profuse suppuration in the mastoid cavity after operation.

DISCUSSION.

Mr. C. E. WEST: This is an extraordinary case, both as to duration and the absence of any symptoms referable to the escape of the fluid, seeing the enormous total quantity of fluid which must have been lost. I have never seen a parallel case in which escape took place from that situation; but one is familiar with escapes of fluid through the internal auditory meatus after translabyrinthine drainage, and with cases of escape both from occipital drainage and after meningitis. Recently I have had two escapes from the lateral ventricle, but in none of them has the flow persisted beyond three weeks. It is difficult to see what could have been the cause of the prolonged escape in Mr. O'Malley's case. Was there any evidence of raised cerebrospinal pressure? Apart from that, I can only conclude there was something in the nature of what ophthalmologists call a "filtration scar." One can scarcely conceive of there being a hole unfilled by tissue for a period of twelve months. Did the patient have headaches?

Mr. SYDNEY SCOTT: I am reminded of a similar condition in a girl whose right labyrinth I opened eleven years ago. Two or three years later she came to the out-patient room saying that on several occasions she had noticed "water" dripping from the ear. I found that fluid having the chemical characteristics of cerebrospinal fluid dripped from her ear for about three days at a time. As it recurred I explored the mastoid cavity and discovered the fluid escaping, not from the labyrinth, but through the planes of dura mater of the middle cranial fossa, which had been exposed at previous operations. Soon afterwards the flow stopped spontaneously, and had not returned when I saw the patient for the last time three or four years ago. These cases present certain features in common with those of cerebrospinal rhinorrhœa which Sir StClair Thomson has described and collected. A few years ago a man was under my observation at the National Hospital for the Paralysed and Epileptic suffering from violent headaches, which were relieved by the spontaneous escape of cerebrospinal fluid from the nose. This recurred repeatedly for over a year. I think Mr. O'Malley's case probably belongs to the same category.

Mr. RICHARD LAKE: The first time I removed a cochlea I took away the modiolus, and there was a free flow of cerebrospinal fluid. As a result there was a great deal of irritation of the skin. I closed up the hole, after a fortnight, with a plug of wax. I wondered whether that might have any bearing on the cause of suppuration in the ear—namely, the irritation from this fluid. One would have thought the fluid was non-irritant.

Mr. H. BANKS DAVIS: One point which interested me very much was this. The note says: "The external meatus was completely blocked by a smooth cyst-like swelling, which, if examined hurriedly, would be easily mistaken for a polypus." A child I operated upon at the hospital four years ago, went into one of the other departments. From there she was referred back to the aural department with the statement that she had a polypoid cyst at the back of the ear, and a request that it be removed. I did not see the case until after an attempt had been made to remove it in the out-patient department by means of the snare. They opened a cerebral hernia. It was scraped, and the child sent home. She was brought back unconscious a week afterwards, with a temporo-sphenoidal abscess and an abscess of the cerebellum. The child is now quite well, but only as a result of extensive operations. I think the posterior wall had been removed, and the brain had been sagging down into the meatus. I always think the removal of polypi in the out-patient room should be undertaken with very great caution.

Mr. O'MALLEY (in reply): I felt that I was dealing with a touchy condition, and I feared the onset of meningitis. My conclusion—if one can draw a conclusion from one case—is that the question of meningitis rests very largely on drainage. I did not begin the packing until I felt sure there was a considerable amount of granulation material. One should not immediately attempt to do firm packing in order to arrest the escape of the fluid; we should wait until there is a good covering of granulation tissue. If packing is then done, it provides a protection against infection. With regard to the profuse suppuration in the mastoid cavity after operation, it seemed very extraordinary to me, on opening the mastoid, to find pus pouring from the cavity. But nothing happened, and the man is now in far better health than at any period during the persistence of the discharge. Formerly he complained of headache and a languid feeling, but has not done so once since the flow has been completely arrested. Apparently, therefore, there is now no persistent pressure. The margins of the meatus look a little thin, and one might have supposed there was fluid near the surface, but I tested for that, and found none. To be quite sure, however, I still pack twice a week.

(*May* 18, 1917.)

Objective and Subjective Ticking in the Ears.

By W. H. JEWELL, M.D.

V. G., A GIRL, aged 11. The ticking began in the ears three months ago and could be heard at three yards distance, but it is not so loud now. It ceases during sleep, swallowing, or deep pressure behind the angle of the inferior maxilla, is independent of the pulse-rate, but corresponds in number and is synchronous with the clonic contractions of the tensors and levators of the soft palate, which are 150 per minute. There is neither blepharospasm, nor any movement in the tympanic membranes, corresponding to the ticking discernible.

Mr. JEWELL: I think this is a case of reflex neurosis, probably due to the presence of adenoids in a child of a neuropathic disposition.

(*May* 18, 1917.)

Case of Squamous-celled Carcinoma of the External Auditory Meatus and Tympanum in a Young Woman aged 22.

By SYDNEY SCOTT, M.S.

THE following is an account of a case of malignant disease which had extensively destroyed the external osseous meatus, while a portion of the growth had invaded the tympanic cavity without destroying its bony walls or ossicles. The patient was first seen on January 26, 1917, on account of deafness and purulent discharge from the right ear. The meatus was full of what looked like granulations and a band of scar tissue which bisected the meatus in the region of the isthmus. She stated she had had intermittent otorrhœa for many years, and that it had been continuous for the previous twelve months. A small swelling formed immediately below the meatus and developed into a subcutaneous abscess, which was opened on February 1. She had no pain, nor tenderness, nor facial paralysis, nor pyrexia. The deafness was moderate and of the ordinary middle-ear type. Slight dizziness had been complained of, but the labyrinthine reflexes were normal. The nose, pharynx, left ear, and cervical lymphatic glands were unaffected.

On February 8 the inframeatal sinus, formed by the opening of the abscess a week previously, admitted a probe upwards and inwards as far as the tympanum, as the subsequent operation proved, without encountering bony resistance. The patient agreed to submit to an exploratory operation, and on February 15 the mastoid process was opened and found to contain normal air cells throughout. The meatus was then opened from behind and a tough troublesome bleeding growth, which had spread through the floor of the meatus into the inframeatal tissues of the neck, was removed. The tympanic plate had been destroyed together with the lower part of the tympanic membrane, the upper half of which was intact, with the handle of the malleus projecting from it. The antrum was then opened and seen to contain more of the growth, which here looked like a polypus projecting backwards, but not completely filling its cavity. The incus was seen to be embedded in, but not destroyed, by the growth.

The operation was completed a week later, that is on February 23, after the histological examination had proved that the disease was carcinoma (Professor F. W. Andrewes). The limbs of the post-aural incision were extended to the temporal region and to the angle of the jaw, and the pinna, with the surrounding skin, was reflected forwards over the cheek. The whole of the mastoid process was removed, together with the fibro-cartilaginous meatus and concha, and all parts down to and including the tympanic ring, outer attic wall, tympanic membrane, auditory ossicles, and remains of the growth which occupied the tympanum. The stapes was left in position, likewise the labyrinth and facial nerve. Only a portion of the parotid salivary gland was removed with the main pre-auricular lymphatic gland, although this was not found to be involved. The wound was closed by suture in the usual way, and healing has taken place uninterruptedly since, but without the insertion of packing or skin-grafts.

No operation for the removal of the cervical lymphatic glands has yet taken place, for it is difficult to get the patient to realize that any further operation would be likely to prolong her life or add to her future comfort.

Comment.—Apart from the patient's youthful age for carcinoma of the ear, the following features appear to be noteworthy:—

(1) The total absence of pain while the disease was active.

(2) The apparently satisfactory extirpation of the growth.

(3) Its evident origin in the meatus.

(4) The question of the absolute necessity or otherwise, of removing the lymphatic glands before they become obviously involved.

(5) The prognosis in comparison with other cases of carcinoma of the ear.

DISCUSSION.

Mr. C. E. WEST: Carcinomata of the meatus represent a very much larger proportion of the total number of carcinomata which are reported as carcinomata of the middle ear than most people admit. That is a point upon which I have insisted on a previous occasion. The cases all have a strong family likeness. Most of them originate in the floor of the meatus, invade the tympanum, and penetrate downwards into the neck and towards the root of the styloid process. They are locally malignant. In my experience, they have rarely had any wide distribution as glandular involvement, and, generally, they recur. (I do not know about Mr. Sydney Scott's results, which, I believe, are better than mine.) The recurrence takes place along the line of the Eustachian tube and the base of the skull, and the patient dies of infection, or meningitis, or acute encephalitis. In some cases the patient has complete freedom for a long time—sometimes permanently—after a sufficiently bold operation.

I have known a patient, after two years of freedom from disease, come back and die from recurrence. I also know a patient who has survived for nine years, and passed through various accidents, and yet had no recurrence of his carcinoma. One patient must now be very old, if he is still living—and I have not heard of his death. I was interested to find Mr. Scott reporting this case, because only a week last Wednesday I operated on a case of squamous-celled carcinoma of the external auditory meatus at St. Bartholomew's Hospital, and it was unlike anything I have seen before. The patient, a woman aged 54, came up a fortnight before the operation, complaining of trouble, apparently furuncular, in the external auditory meatus. I am afraid that, in the press of out-patient department work, I did not go further with it: I turned the case over to the house surgeon, who incised it. A week later the woman returned with the meatus full of a fungating growth. There was a fixed mass, about the size of a filbert nut, below the meatus. The whole of the floor of the anterior wall of the bony meatus had been destroyed, and the growth in the meatus was continuous with that in the neck, where it went downwards ¾ in., and inwards practically as far as the styloid process. It had invaded the tympanum, but only, I think, in a polypoid way: there was no erosion of the bony walls of the tympanum. I did what I could in the region of the Eustachian tube, and after I had got into the carotid canal I judged that discretion was the better part of valour, and did not proceed further there. The points common to this case and Mr. Scott's are: the rapid growth, the destruction of the floor of the meatus, and the absence of any glandular involvement. The most important surgical question is, what should be done in the neck if one is satisfied that the primary growth has been cleared away? In my case I could not satisfy myself on that point. The patient was a stout and flabby woman, past middle age. What I believe is right in these cases is a procedure which I have employed a certain number of times, and I am interested to see that Mr. Wilfred Trotter advocates it. If there are no palpable glands, do an ordinary clearance operation but leave the sternomastoid. If there are such glands, clear everything, including the whole length of the sternomastoid muscles, the floors of both triangles, if necessary the submaxillary and parts of the parotid salivary glands, the internal jugular vein, and the whole of the overlying lymphatic structures, in a single sheet, and if possible without seeing the surface of any lymphatic gland. This method gives very good exposure, and there is astonishingly little loss of function. In one case so treated, you would not know that he had lost anything in the way of function in the neck and shoulder. You can be fairly certain, not quite, that there will be no glandular recurrence in the neck. The attempt to follow along the Eustachian tube appals me. Has anyone been bold enough to make it, save with the cautious use of a curette? I should like to make the attempt, but lack the courage.

Mr. W. M. MOLLISON: One explanation of the absence of pain while the disease was active may be, that pain in these cases is due solely to the pressure exerted by the growth when in a closed cavity.

Mr. SYDNEY SCOTT (in reply): I do not remember any case of malignant disease of the ear free from recurrence for more than four years, except the case of rodent ulcer, but my experience is limited to twenty-one altogether. [The PRESIDENT: Were the twenty-one all carcinomatous?] They include two of rodent ulcer and four of sarcoma. An interesting point concerns the site and direction of recurrent growth, which is nearly always *in situ*, and locally very malignant. I find the disease invades the temporal fossa or involves the cervical region, and the logical procedure in the former case would be, to excise the temporal muscle, the temporo-mandibular joint, and part of the mandible, but I have not seen a case which justified this being done. I have of course, like Mr. West, removed the sternomastoid completely with the glands of both cervical triangles, but I still feel uncertain whether to practise this as a routine, for the disease does not always follow this downward direction.

Mr. C. E. WEST (answering Mr. Scott): I should leave the patient alone, watching the condition of the cervical glands very carefully. If they begin to be palpable, there will be still time to clear the neck.

(*May* 18, 1917.)

Another Case of Translabyrinthine Drainage for Streptococcal Lepto-meningitis, with Recovery.[1]

By SYDNEY SCOTT, M.S.

THE patient, G. G., is a governess, aged 24, who suffered from chronic suppurative otitis media, which had already been treated by the radical mastoid operation on each side, before she came under my observation in May, 1916, when the following history was obtained.

History: Intermittent bilateral otorrhœa and deafness began in childhood. Two years ago the left ear was treated by the radical mastoid operation by Mr. Muecke. Four months ago the right ear became painful and discharged, and, six weeks later, the radical mastoid operation was done on this side by Mr. Badgerow. The earache and discharge subsided, but the patient continued to complain of headache, dizziness, vomiting, and very loud tinnitus. She developed neurasthenia, with insomnia, and was profoundly depressed mentally and showed determined suicidal tendencies. She had to be constantly watched, and, nine weeks afterwards, was examined by Dr. Hinds Howell, who was able to exclude disease of the central nervous system. A fortnight later Mr. Badgerow asked if I would take her under my care.

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[1] The above is an almost parallel case to one recorded in the *Proc. Roy. Soc. Med.*, 1913, vii (Sect. Otol.), p. 4, and to another recorded in *ibid.*, ii, p. 11.

Condition before Exploration.—It was at this period (May 11, 1916) I noticed a slight internal squint of the right eye with right facial weakness, but in view of Dr. Howell's recent report this was not to be attributed to a ganglionic lesion. There was no spontaneous nystagmus or Rombergism, though the patient walked with apprehension. At this time the right mastoid-meatal cavity was occluded by scar tissue, *pressure on which caused vertical nystagmus downwards, with forced movements of the head and trunk backwards and to the right.* This "fistula symptom" was therefore unlike that usually met with in fistula of the external semicircular canal, or in the case of an unduly mobile stapes.

HEARING TESTS.

	Right		Left
Low tone range limit (Bezold)	55 d. v.	...	90 d. v.
High tone range limit (steel monochord) ...	36 cm. 16 ,,	(Air) (Bone)	36 cm. 16 ,,
Rinne		Negative	
Weber		Doubtful	
Schwabach		Confused by tinnitus	

Raised voice was heard and understood on both sides.

In face of the risks I agreed to explore the right ear, and on the morning of May 17, 1916, I re-opened the mastoid and tympanic cavities, removed the dense tissue and new bone which encroached upon the tympanum and meatus, and obtained a satisfactory exposure of the inner tympanic wall. No fistula either of the external semicircular canal or of the oval window was discernible, neither could any opening be discovered with the fine flexible probe. There was some erosion of the posterior part of the promontory of the cochlea, and of the Fallopian aqueduct, but the fossula rotunda was unrecognizable. I thereupon left the labyrinth alone. Next morning (May 18) the tinnitus was the same as ever, and *spontaneous nystagmus* now appeared for the first time, being directed to the left (there was no nystagmus the evening after the operation), so it seemed evident from the direction and time of onset of the nystagmus that the labyrinth was becoming in some way involved. The giddiness also increased, and any movement of the head provoked vomiting: the facial paresis was more marked. On May 19

I awaited events; the evening temperature rose to 102·2° F., and the pulse-rate to 110. Next morning (May 20) the temperature had fallen to 99° F., and the pulse-rate to 76, suggesting an improvement, but there was now definite cervical rigidity; Kernig's sign was obtainable, while the tendon reflexes were diminished though not abolished. Moreover, the cerebrospinal fluid, which was now withdrawn by lumbar puncture, was found to be already "cloudy" (a later report by Dr. Stansfeld stated that it contained an excess of polymorphonuclear cells and yielded a pure growth of streptococci on cultivation).

Labyrinth and Internal Auditory Meatus Opened.—After withdrawing 20 c.c. of cerebrospinal fluid the vestibule and cochlea were opened through the meatus, without disturbing the sutures of the mastoid incision, and with a narrow gouge a free communication was established between the vestibule and internal auditory meatus, through which cerebrospinal fluid escaped freely and continued so to do for several days.

The improvement which followed was rapid and continuous; in twenty-four hours the headache and cervical rigidity had disappeared; the cerebrospinal fluid, withdrawn daily by lumbar puncture, was under less pressure, only 7 c.c. being collected, and this was "less cloudy," and in seventy-two hours was clear. The temperature returned to 98° F. and pulse-rate to 80, no subsequent rise taking place. The patient left the hospital in three weeks, and at first experienced the usual phenomena following ablation of one labyrinth. The facial paresis and internal strabismus disappeared two or three weeks afterwards, but the tinnitus remained loud and persistent, quite unchecked by the operation for fully two or three months; subsequently it gradually ceased to trouble the patient, who in the meantime had become cheerful and well.

Note.—The purpose of recording this case is to emphasize the importance of *early diagnosis* of lepto-meningitis, and at the same time the value of *immediate drainage* of the meninges through the labyrinth, when the signs indicate that this has been the route of infection, just as was shown in the case which I first described in the *Archives of Otology*, 1908, xxxvii, p. 108.

DISCUSSION.

Dr. DAN MCKENZIE: As in this successful case, I also have been able to rescue several patients from the jaws of death by this and other means of draining the meningeal spaces. If the ease of the operation were better known, I think more men would be disposed to tackle cases of meningitis. Meningitis is regarded practically as a death-warrant, and so, often, nothing is done beyond a radical mastoid operation. But cases like Mr. Scott's show how unjustifiable it is to allow the patient to die without making an attempt to drain. I heartily support Mr. Scott's procedure in instituting prompt drainage when the diagnosis has been made; and now it is possible to make the diagnosis sufficiently early to save the patient in many cases. To decline to drain in meningitis is no more justifiable than to decline to open the abdomen in peritonitis.

Mr. W. M. MOLLISON: I do not agree with Dr. McKenzie. I prefer to treat these cases of lepto-meningitis not by draining to the internal auditory meatus, but by making incisions into the dura mater. Those cases which I have saved have been saved in that way. I did not find opening the internal auditory meatus as easy as Dr. McKenzie suggests: possibly I did not use the right instruments. The facial nerve was always very worrying in such cases, and I found it very dangerous to establish really good drainage when I had got through. And I do not agree with Dr. McKenzie in opening through the meatus as soon as the diagnosis of meningitis is made, because so many of these early cases can be saved by continuous lumbar punctures: these—a trivial operation—during the first twenty-four hours may save the patient.

Mr. C. E. WEST: I agree, to some extent, with all the speakers. The operation of translabyrinthine drainage is a remarkably easy one. It takes a very brief time after finishing the radical mastoid operation, and in many of the cases efficient drainage can be readily established, which will last four or five days; in some cases it has lasted fourteen days. But only a small proportion of the meningitis cases I have treated in this way—or in any other way—recover. One has had stray recoveries by all methods except in that of incision of the dura mater. I have incised the dura mater at various points. If nothing be interposed between dura mater and brain, the brain becomes adherent, and if gauze is interposed, it becomes infiltrated with lymph, and drainage ceases. When once withdrawn, it is impossible to put the gauze back. There are adhesions all round between brain and dura mater; in fact I have carried out this procedure for the very purpose of establishing adhesions. I agree with Mr. Mollison that in early cases perhaps the simplest and most effective method is either continued thecal drainage or thecal lumbar puncture—both simple methods. After fairly extensive trial of every method of treating meningitis I have heard of, I am coming back to thecal drainage as being the most hopeful way of treating cases. This matter was discussed in our Section at the International Congress of Medicine, and the further I attempt to treat cases of meningitis, the more convinced I am that the real secret, as was stated on that occasion, is that the choroid plexus blocks out the antibody. There are practically no antibodies in the cerebrospinal fluid, and until you can get a high antibacterial content in the cerebrospinal fluid, either by introducing it mechanically, or as an antiserum, or by altering the permeability of the plexus, the great bulk of the cases of meningitis will be lost.

Mr. SOMERVILLE HASTINGS: The only cases of meningitis in which I have experienced recovery have been those treated by repeated lumbar puncture. I should like to hear from Mr. Scott whether, with a normal labyrinth, he considers it justifiable to do translabyrinthine drainage. I should also like to know something of the method Mr. West employs for continuous thecal drainage, because I have never done it, and I would like to try it.

Mr. C. E. WEST (replying to Mr. Somerville Hastings): The method of continuous thecal drainage is exceedingly simple. It consists of the introduction of a suitable trochar cannula into the theca in the ordinary position of lumbar puncture. It gives the most extravagantly profuse drainage. The end of the trochar comes out in the centre of a large rubber sheet, and over that are placed sterile sponges or swabs. Periodically the sheet is opened out and the sponges replaced.

Mr. SYDNEY SCOTT (in reply): In answer to Mr. Somerville Hastings, as mentioned in the note at the end of my case, it seems to me that the chief indication for draining the basal meninges through the labyrinth occurs when the meningitis is preceded by labyrinthitis, as is so frequently the case in otitic meningitis. When the patient is *in extremis* when first seen, I think it the right procedure whether one knows the labyrinth to be affected or not.

Specimens and drawings illustrating the anatomy of the Fallopian canal were shown by Dr. DAN MCKENZIE.

A series of stereoscopic skiagrams of the temporal bone was exhibited by Dr. ROBERT KNOX.

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